This Week in The Iron Age

JUNE 27, 1940

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The Iron Age

JUNE 27, 1940

ESTABLISHED 1855

"Fustest and Mostest"

DOWN from Civil War days comes the famous saying that success in military operations consists of "getting there fustest with the mostest men." To which in these modern days might be added "and the mostest machines."

If you take this saying, as brought up to date with its machine appendix and apply it to the present European struggle, you will see that this is exactly the formula that has enabled Hitler to sweep through Europe with such amazing speed.

Individually compared as man to man, tank to tank, gun to gun, and plane to plane, Germany has no outstanding superiority. Talk of mysterious super-weapons is alarmist twaddle. But Hitler has the most and gets it there first. That's nearly all there is to it.

But not quite all, for back of the existence of his "mostest" machines is a realistic conception of obsolescence.

Hitler's conception of military mechanical obsolescence is as realistic as is the conception of product obsolescence by our own automobile industry. Both know that if you change models too often, you get no output.

Mr. Knudsen, of course, is thoroughly familiar with this fact, but his function is not that of passing on design, nor of specifying quantities. His job is to see to it that the goods are produced after these things have been decided.

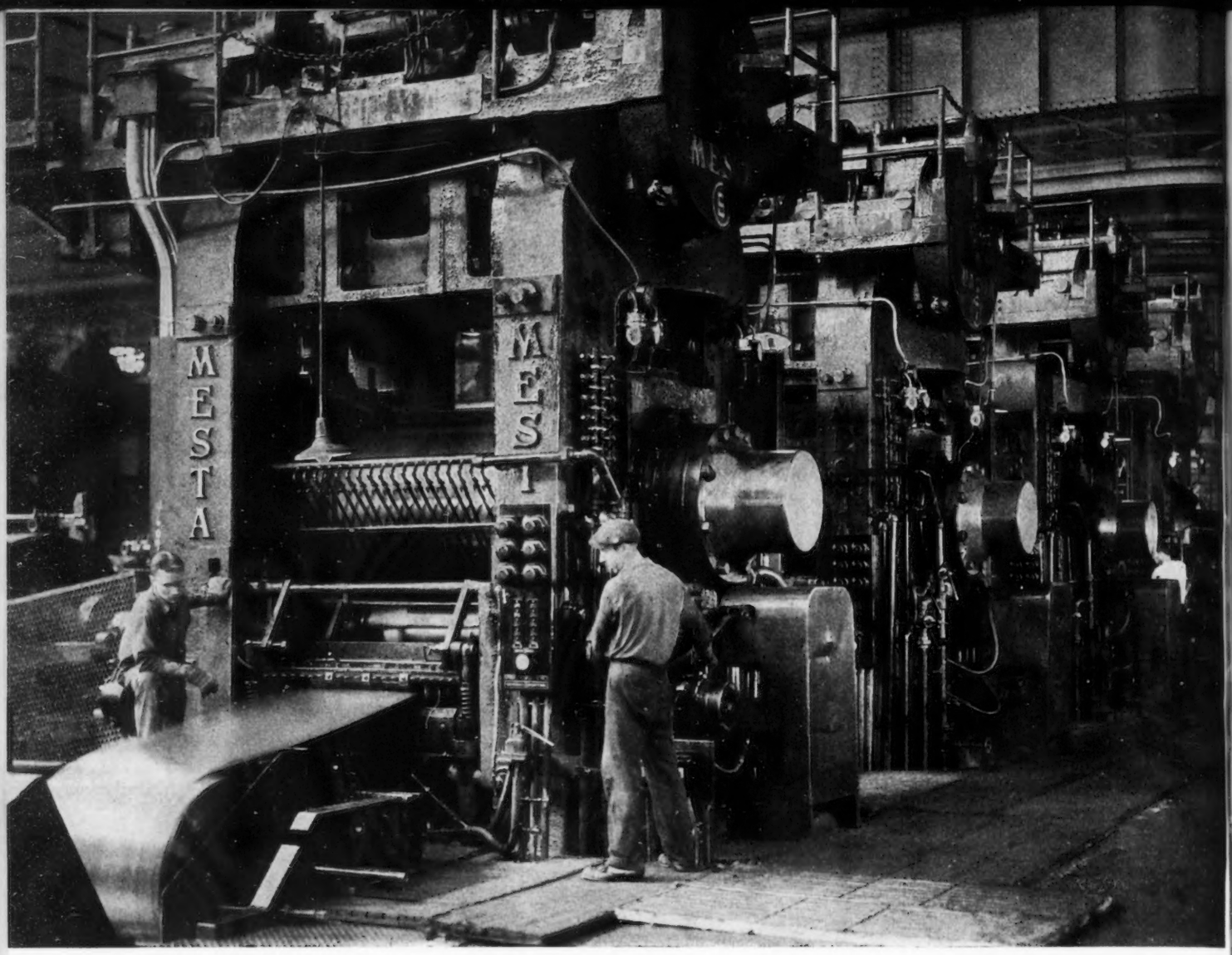
As yet, with some exceptions, there has evidently been no definite policy set down as to a balance between obsolescence and quantity production. This is evident by present discussion and opinion. And a decision as to that balance is absolutely necessary as a first step, unless we intend to pour more armament billions down the knot hole.

Take, as an illustration, our airplane problem. Some hold that there is no use in making planes in large quantities because a given model is out of date almost as soon as it is in production and that, indeed, we can therefore afford to give away or sell what we already have. At the other extreme is the thought and the talk of creating a production capacity of 1000 planes a day!

If Mr. Hitler had believed in and followed the first school of thought, namely that nothing but the latest and best would serve, he would today have one plane, one tank, one machine gun and a million and a half soldiers in action.

On the other hand, if he had built up a capacity of 1000 planes a day —and had produced them at that rate for only six months, he would by now have stripped himself of vital raw materials, would have nine-tenths of them grounded for lack of pilots and ground crews and would not have enough field space in which to store, let alone fly them. "Mostest" is enough when you have as many as you will need.

J. H. Van Deventer



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CASE HARDENING in LIQUID BATHS

By F. D. WATERFALL
Cassel Cyanide Co., Ltd., Birmingham, England

IN this article salt bath case hardening methods in the United Kingdom—which are different from American practices — are described and certain commonly accepted statements about cyanide bath case hardening critically examined. In this, the first of two parts, attention is directed specifically to case depth and hardness, brittleness as related to case hardness, selection of cyaniding temperature, treating of alloy steels, etc.

CASE hardening in cyanide baths was initially developed in the United States. Bath temperatures were limited by the necessity of preventing excessive fume and drop in bath strength, and covering of the surface of the bath with carbonaceous material was not practiced until recently. Temperatures were, therefore, not in excess of 850 deg. C. (1562 deg. F.) and bath strengths approximately 30 per cent NaCN.

In Britain the trend has been to higher temperatures and higher cyanide bath strengths, the surface being covered with a carbonaceous (usually graphitic) layer to prevent excessive fuming and reduce cyanide consumption. The covering at the same time helps economy in fuel. The strength of bath used is usually 40 to 50 per cent NaCN, although lower strengths are fairly common.

Advantage is taken of the faster speed of penetration of carbon at higher temperatures so that temperatures of 900 to 950 deg. C. (1652 to 1742 deg. F.) are usual and case depths up to 0.03 in. (or more) are obtained at these temperatures.

In Fig. 1 are shown time penetration curves at various temperatures, for baths of cyanide analyzing 40 to 50 per cent NaCN. These high strength melts are made initially by melting equal weights of anhydrous sodium carbonate and 98 per cent sodium cyanide. During immersion in the cyanide bath steel absorbs both carbon and nitrogen.

The proportion of carbon and nitrogen in the case is dependent on three main factors: (1) the temperature of the bath; (2) the bath strength; (3) the thickness of carbonaceous covering on the bath. As the temperature of the bath is lowered, the ratio of nitrogen to carbon in the case increases; that is, at the higher temperatures, such as 900 to 950 deg. C. (1652 to 1742 deg. F.), carbon predominates, but as the temperature of operation is lowered to 800 deg. C. (1472 deg F.), the carbon percentage in the case diminishes while that of nitrogen increases. Typical analyses on S.A.E. 1015 steel are set out in Table I.

With no carbonaceous covering on the cyanide bath a "mixed" case of carbon and nitrogen is produced, the proportion of carbon to nitrogen depending on bath strength and temperature. When a carbonaceous covering is used the tendency is for the carbon content of the case to increase and the nitrogen content to decrease. The thicker the carbonaceous layer, the greater the tendency for production of a pure carbon case. The thickness of the carbon covering in production working is limited by several factors, but is usually from ¼ in. to ¾ in.

As far as can be determined, the carbon covering on a cyanide bath does not, in itself, enter into the carburizing reaction. The steel receives carbon solely from breakdown of cyanide.

As shown in Fig. 1, considerable depth of case can easily be obtained in a cyanide bath at the correct temperature and cyanide strength.

It is generally accepted that about 50 per cent of the total depth of a normal pack-carburized case on S.A.E. 1015 steel is glass hard after water quenching. Fig. 2 shows depth-hardness curves for three bars carburized for 2¼ hr. at 950 deg. C. (1742 deg. F.) in cyanide baths analyzing 50 per cent, 40 per cent and 30 per cent respectively, and covered with a carbonaceous layer. The total depth of case applied by this means (at least in 40 to 50 per cent NaCN baths) would be 0.032 in. After carburizing and quenching in oil the bars were reheated to 780 deg. C. (1436 deg. F.) and quenched in water. The results show that considerable depth-hardness is obtainable. Indeed the test bar treated in the 50 per cent bath has a glass hard zone forming 53 per cent of the total case. This is comparable with results obtainable in pack hardening practice. Even the bar treated in the 30 per cent bath has a fair depth of glass hard zone. Cases with less total depth than the above produced by

TABLE I

S.A.E. 1015 Steel Treated 2½ hr. in 50 Per Cent NaCN Bath
(Carbonaceous Covering Used)

Bath Temperature	950 Deg. C.		900 Deg. C.		850 Deg. C.		800 Deg. C.	
	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent
Cut No. 1 (0.003 in.)	0.86	0.18	0.91	0.22	0.81	0.21	0.73	0.55
Cut No. 2 (0.003 in.)	0.86	0.05	0.78	0.21	0.65	0.11	0.26	0.17
Cut No. 3 (0.003 in.)	....	....	....	....	....	....	....	....
Cut No. 4 (0.003 in.)	0.74	0.04	0.57	0.06	0.41	0.05	0.20	0.05

TABLE II

S.A.E. 1015 Steel Treated 2½ hr. at 950 Deg. C.
(Carbonaceous Covering Used)

Bath Strength	50 Per Cent NaCN		40 Per Cent NaCN		30 Per Cent NaCN		20 Per Cent NaCN		10 Per Cent NaCN	
	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent	Carbon, Per Cent	Nitrogen, Per Cent
Cut No. 1 (0.003 in.)	0.91	0.11	0.92	0.10	0.76	0.12	0.51	0.16	0.52	0.26
Cut No. 2 (0.003 in.)	0.80	0.08	0.78	0.07	0.66	0.08	0.54	0.10	0.41	0.13
Cut No. 3 (0.003 in.)	....	....	....	....	....	0.06	....	....	....	....
Cut No. 4 (0.003 in.)	0.64	0.05	0.61	0.06	0.52	....	0.32	0.07	0.31	0.08

TABLE III

Steel (0.15C, 1.3 Mn, and 0.12S) Treated in 45 Per Cent NaCN Bath

Test Piece No.	Bath Temperature Deg.C.	Bath Temperature Deg.F.	Immersion Time	Quenched In	Vickers Hardnesses 5-kilo	Vickers Hardnesses 1-kilo	Estimated Case Depth, In.	Remarks
1	900	1652	10 min.	Water	860,850	...	0.004	With carbonaceous covering
2	900	1652	25 min.	Water	910,880	...	0.01	
3	850	1562	10 min.	Water	825,725 740	820 860	0.003	
4	850	1562	35 min.	Water	875,890	...	0.01	
5	800	1472	10 min.	Water	740,690	840 805	0.002	
6	800	1472	30 min.	Water	865,855	...	0.005	
7	800	1472	1 hr.	Water	810,790 810	805 790	0.01	
15	850	1562	10 min.	Water	875,875	...	0.003	Without carbonaceous covering
16	800	1472	10 min.	Water	780,795	820 805	0.002	

TABLE IV

Steel (0.15C, 1.3 Mn, and 0.12S) Treated in 30 Per Cent NaCN Bath

Test Piece No.	Bath Temperature Deg.C.	Bath Temperature Deg.F.	Immersion Time	Quenched In	Vickers Hardnesses 5-kilo	Vickers Hardnesses 1-kilo	Estimated Case Depth, In.	Remarks
8	900	1652	10 min.	Water	885,805	...	0.004	With carbonaceous covering
9	900	1652	25 min.	Water	900,855	...	0.01	
10	850	1562	10 min.	Water	875,850	...	0.003	
11	850	1562	35 min.	Water	865,875	...	0.01	
12	800	1472	10 min.	Water	690,715	860 820	0.002	
13	800	1472	30 min.	Water	825,865	...	0.005	
14	800	1472	1 hr.	Water	825,825	...	0.01	
17	850	1562	10 min.	Water	900,875	...	0.003	Without carbonaceous covering
18	800	1472	10 min.	Water	795,810	805 740	0.002	

an immersion of 40 min. at 950 deg. C. (1742 deg. F.) in a 43 to 44 per cent NaCN bath, quenched in oil from carburizing and reheated to 780 deg. C. (1436 deg. F.) then water quenched, showed on depth hardness tests 0.008 in. glass hard (i.e. above 800 V.P.N.) out of a total depth of 0.018 in.

The foregoing indicates that it is possible to grind parts carburized in the cyanide bath under suitable conditions quite extensively without loss of hardness.

Brittleness vs. Case Hardness

The opinion that the cyanide case is brittle is quite widespread and the reason is said to be the presence in the case of nitrides which have high hardness. To support this view photomicrographs of slowly cooled pieces are sometimes produced which show a patchy structure with the appearance of needles in some places.

In Great Britain the view is gaining ground that the cyanide case is less brittle than a case of similar depth produced by pack hardening. It has been found possible to distort considerably without chipping the threads of bolts cased to 0.015 in. in cyanide at 950 deg. C. followed by water quenching.

The two views will be examined critically and an attempt made to correlate them.

Shallow cases produced in cyanide should not be compared with deeper cases produced in the pack. The comparison should be on cases of similar depth. S.A.E. 1015 steel parts carburized to, say, 0.03 in. in cyanide at 900 to 950 deg. C. (1652 to 1742 deg. F.) and afterwards refined and hardened will be found to have similar hardnesses to those case hardened in the pack. Figures generally are 60 to 66 Rockwell C and Vickers hardness, 780 to 920. It will be mentioned later and shown (Table IX) that impact specimens of three steels, machined to finished size then carburized to similar depths in cyanide and in the box, gave similar izod figures, showing *no* increase in brittleness in the cyanide specimens as compared with the box carburized specimens. The view that the cyanide case is brittle has doubtless arisen from examination of specimens with shallow cases, and such cases are dealt with in the following section.

Polished test pieces of steel containing approximately 0.15 per cent carbon, 1.3 per cent manganese and 0.12 per cent sulphur were treated at varying temperatures and for different times in a high and a low strength cyanide bath, both with and without a

carbonaceous covering, and then quenched in water. Afterward, Vickers hardnesses were determined. The results are shown in Tables III and IV.

A 5-kilo (11-lb.) load was found to be too great when testing some of the specimens with very shallow cases. In these instances hardness tests were done with a 1-kilo (2.2-lb.) load.

The results given in Tables III and IV show similar hardness when case depths vary between 0.002 in. and 0.010 in. and carburizing is done between 800 deg. and 900 deg. C. (1472 to 1652 deg. F.) in either 45 per cent or 30 per cent NaCN baths with or without carbonaceous coverings. The hardnesses found are similar to those obtained in deeper cyanide, or pack carburized, cases.

These results do not support the statement that brittleness in the cyanide case is due to high hardness or hardness in excess of that obtained by pack carburizing. In Table I it is shown that the nitrogen content of the case can be increased by lowering the temperature of the cyanide bath. From this it is reasonable to expect that as the bath temperatures in Tables III and IV were lowered, the nitrogen content in the case of specimens treated would increase, yet the hardnesses of the 800 deg. C. pieces are actually slightly lower than those of the 900 deg. C. pieces, which contradicts the view that a high nitrogen content in the case causes high hardness. One reason for the lower hardness of the 800 deg. C. pieces would be their lower carbon content. The relation of nitrogen content to hardness will be further dealt with herein.

All the above pieces were bend tested, but in no instance was spalling of the case observed. The amount of bend obtained on specimens was governed by case depth and by temperature of treatment, but a number of the pieces bent more than 90 deg.

Figs. 3 and 4 show the martensitic case on specimens No. 2 (Table III) and No. 14 (Table IV) respectively. Figs. 5 and 6 are the structures of speciments No. 2 and No. 14 respectively after reheating to 800 deg. C. and air cooling, and Fig. 7 is of specimen 14 after reheating to 800 deg. C. and slowly cooling in a crucible of molten cyanide. Figs. 3 and 4 are similar, but a marked difference is apparent between Figs. 5 and 6. Fig. 5 shows that specimen No. 2 has almost completely transformed to pearlite or

* See "The Iron Nitrogen System," by Epstein, Nitriding Symposium, p. 19.

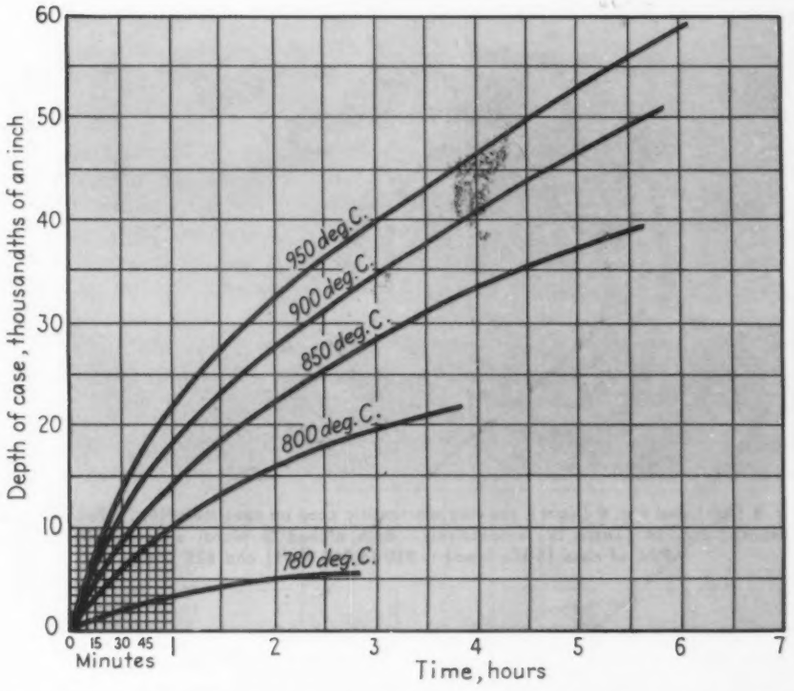


FIG. 1—Time-penetration curves at various temperatures, for baths of cyanide analyzing approximately 50 per cent NaCN.

pearlite plus braunite on cooling, but a number of white patches are present in Fig. 6, doubtless due to the higher nitrogen content of specimen No. 14.

Specimen No. 14, when being treated in cyanide at 800 deg. C. (1472 deg. F.) would be gradually absorbing carbon and nitrogen and the case would be austenitic, having carbon and nitrogen in solid solution. If sufficiently slowly cooled, th eutectoid pearlite and braunite would form and perhaps some nitride needles, but water quenching from 800 deg. C. prevents their formation and martensite results, as in Fig. 4. The martensite contains both carbon and nitrogen*. The fallacy of showing nitride needles in slowly cooled specimens to account for brittleness in water-quenched specimens is obvious. The influence of nitrogen can only be detected in its effect on the hardness of the martensite produced. It has already been shown that similar hardnesses can be obtained with specimens which have different nitrogen contents.

Now, there may be an inquiry as to the nature of the white areas in Figs. 6

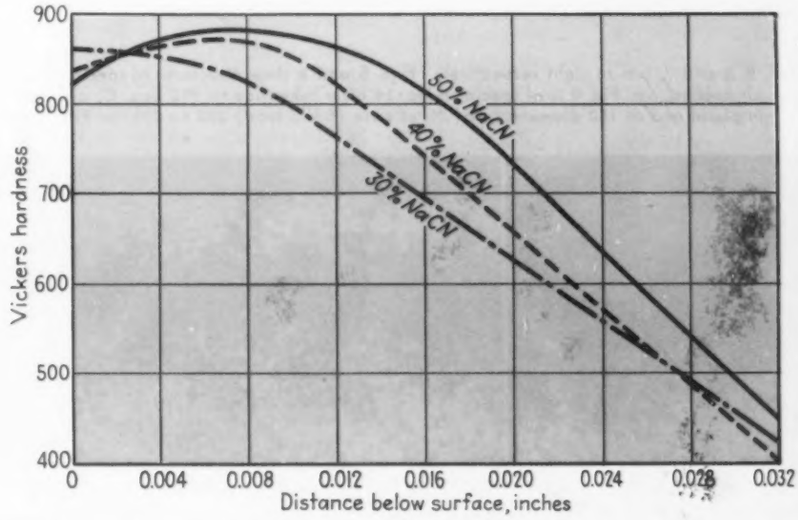


FIG. 2—Depth-hardness curves with varying strength cyanide baths. All bars carburized 2¼ hr. at 950 deg. C. and oil quenched; reheated to 780 deg. C. and water quenched. Vickers hardness at 10-kilo load. Thickness of case above 800 V.P.N.: 0.017 in. at 50 per cent NaCN, 0.013 in. at 40 per cent NaCN, and 0.009 in. at 30 per cent NaCN.

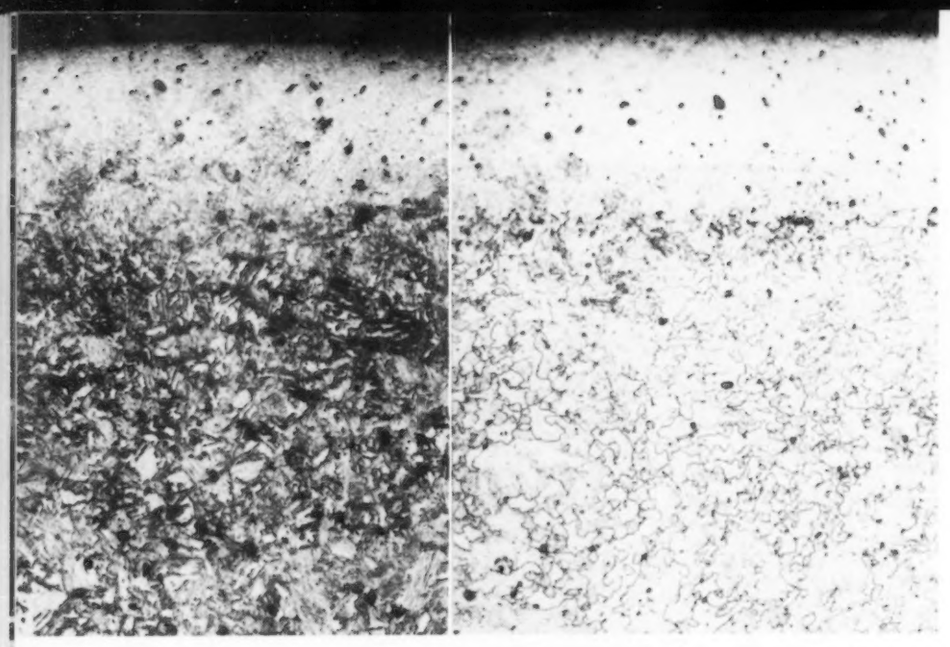


FIG. 3 (left) and Fig. 4 (right), showing martensitic case on specimen No. 2 (Table III) and specimen No. 14 (Table IV) respectively. Both etched in picral and at 150 diameters. V.P.N. of case (5-kilo load) is 880 to 910 (left) and 825 (right).

and 7. Fig. 4 shows the case of specimen No. 14 when water-quenched after 1 hr. at 800 deg. C. (1472 deg. F.) in 30 per cent NaCN to be almost entirely martensitic (and white etching). The same specimen air cooled from 800 deg. C. as shown in Fig. 6 shows less white constituent and the presence of pearlite or pearlite plus braunite, while still slower cooling, as in Fig. 7 showing specimen No. 14 slowly cooled in a crucible of cyanide, reveals still less white constituent and more eutectoid. It is reasonable to assume that with very slow cooling the white constituent would entirely disappear. In other words, this constituent is martensite. Prolonged etching will show unmistakably that it is martensite. The presence of nitrogen seems to slow down the rate of etching markedly. Some elongated lakes could be detected in the martensitic areas of the specimen in Fig. 7. These are most likely nitrides or nitrides plus carbides. No lakes were present in the specimen shown in Fig. 6.

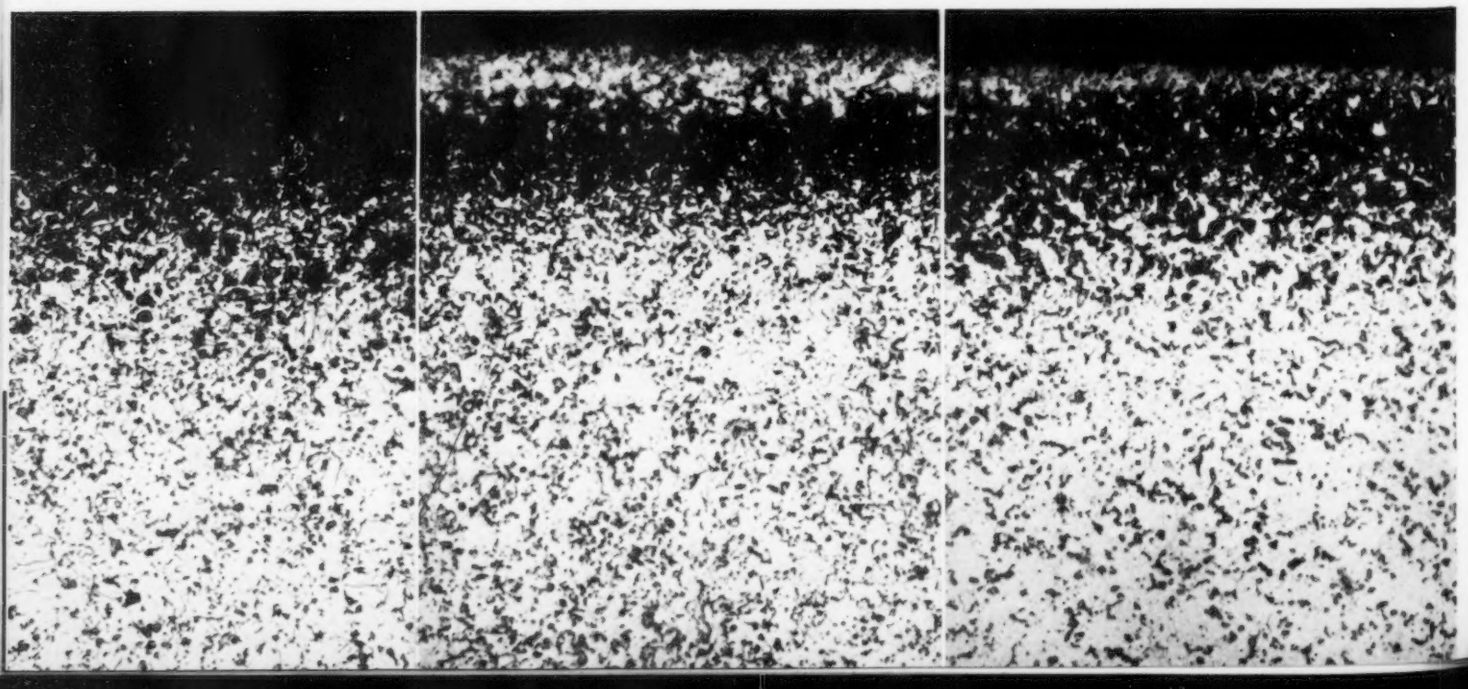
The foregoing explanation can be correlated with the fact that on parts cased in cyanide to a fair depth at 900 deg. C. (1652 deg. F.)—where the surface nitrogen content is high — a soft skin can be detected with a file or Vickers hardness machine. This skin has been found to be austenite. Moreover, austenite has been found on the surface of 1.4 per cent carbon steel files treated in cyanide at 800 deg. C. (1472 deg. F.). The higher the nitrogen content, the greater appears to be the tendency for complete suppression of the A_r point. A given percentage of nitrogen seems to be far more potent than a similar percentage of carbon in its ability to depress the A_r point.

That nitride needles *can* be produced in mild steel under suitable conditions hardly needs emphasizing, but that they are present in cyanide cases obtained at 800 to 900 deg C. (1472 to 1652 deg. F.) with water or oil quenching seems unfounded. If high nitrogen does not cause high case hardness and nitrides are not present in cyanided cases, how has the statement arisen that cyanided cases are brittle? The explanation is probably threefold:

(I) Delicate parts with sharp corners are frequently treated in cyanide and much less frequently in the pack. Hardened corners are prone to chip, or even to crack in quenching.

(II) Thin cases are applied in cyanide and not in the pack. A hard case has very low "strength" and the core is soft — particularly with very low carbon steels. Localized pressure causes indentation of the core and cracking of the case. This is easily observed by making an indentation hardness test with a load much in excess of that which the case is able to support. The cracking is prevented by increasing the case depth. A light case necessarily has an extremely thin transition zone, so a thin hard layer is superimposed on a soft steel. Even although no spalling was obtained on bending the specimens described in Tables III and IV, a state of affairs can be visualized where spalling might occur due to *lack of transition zone*. This lack could be overcome by increasing the case depth, but such a method may be impracticable on some small pieces which would then have too much case for their section, thereby being brittle.

FIGS. 5, 6 and 7, left to right respectively. Figs. 5 and 6 show structures of specimens No. 2 and 14 respectively, after reheating to 800 deg. C. and air cooling, and Fig. 7 is of specimen No. 14 after reheating to 800 deg. C. and slowly cooling in a crucible of molten cyanide. All etched in picral and at 150 diameters. V.P.N. of case (5-kilo load) 280 to 285 for Fig. 5, 460 to 494 for Fig. 6, and 353 to 358 for Fig. 7.



(III) The effect of water-quenching coarse grained steel from cyaniding temperatures of 780 to 850 deg. C. (1436 to 1562 deg. F.) is to produce a brittle fracture *in the core*. This has been wrongly attributed to the cyanide case, which has been said to be extremely brittle and to impose its brittleness on the core. This will be further dealt with later in this article.

The above evidence indicates that there is no justification for the statement that the cyanide case is more brittle than an equivalent case produced in the pack.

After treatment at lower temperatures—other things being equal—the nitrogen content of the case is higher than at more elevated temperatures. From this it might be assumed that parts which are required hard, but which must be oil quenched from the cyanide bath (because of danger of distortion on water quenching) should be cyanided at low temperatures in order to obtain high nitrogen pickup and better hardness. Hardness tests of two sizes of S.A.E. 1015 steel carburized to the same depth (0.010 in.) at different temperatures show that better hardnesses are obtained by oil quenching from the *higher temperatures*, i.e. 900 deg. C. (1652 deg. F.), instead of 850 deg. C. (1562 deg. F.) of 800 deg. C. (1472 deg. F.). This may be due to retention of austenite in the pieces cyanided at the lower temperatures because of increased percentage of nitrogen as compared with pieces treated at 900 deg. C.; or again it may be due to variation in grain size in the pieces. Results are shown in Table V and Fig. 8.

The heating of parts such as gears made of oil hardening alloy steels in cyanide baths, so as to improve wear resistance by conferring a superficial hard case, is now widespread. If impact tests are conducted on notched test pieces treated (a) in cyanide and (b) in the muffle, it will be found that the conferring of a hard case produces a marked drop in impact resistance. In one series of tests, muffle hardened steel of S.A.E. 3250 type showed 8 to 10 ft.-lb. Izod impact, while similar pieces treated in the cyanide bath at an equivalent temperature gave only 3 ft.-lb. The presence of the case in the root of the notch in the specimen appears to have an important effect. In view of the freedom from failure by shock of cyanided gears, where the notch effect is less than with an Izod specimen, it is probable that unnotched "Izod" specimens would show less difference in impact resistance between muffle and cyanide hardening.

The writer is able to quote a report by a well-known Sheffield steelmaker, on various alloy steels treated in a 40 to 45 per cent cyanide bath at temperatures of 850 deg. C. (1562 deg. F.) and 900 deg. C. (1652 deg. F.) followed by oil quenching. It is shown that steels of the S.A.E. 5140 and 3250 (+ molybdenum) type approach closely the maximum surface hardness after 20 min. at 850 deg. C., followed by oil quenching, the hardness then being Vickers P.N. 730 to 740. These steels and a large number of alloy steels of different types (including lower carbon steels such as S.A.E. 3312 and "Krupp"), after treatment for 10 to 60 min. at 850 deg. C. (1562 deg. F.) and 900 deg. C. (1652 deg. F.), followed by oil quenching, when submitted to load deflection tests were all satisfactory and no spalling of the case occurred.

The above oil hardening steels had a case depth of 0.009 in. after 20 min. at 850 deg. C.

Not infrequently eutectoid and hypereutectoid plain carbon and alloy steels, are heated in the cyanide bath for hardening. Temperatures vary from 760 to 950 deg. C. (1400 to 1752 deg. F.) according to the nature of the steel. Bath strengths should be kept around 50 per cent for eutectoid steel to prevent partial decarburization. A 30 per cent cyanide bath would tend on long immersion to reduce the surface carbon content.

A eutectic bath of sodium and potassium cyanide appears to be common in America for this purpose. Some use is made of such a bath in Britain, but a simpler and cheaper bath made from 98 per cent sodium cyanide is rather more common. The pure salt has a melting point of 560 deg. C. but after a few hours at 570 to 600 deg. C. (1058 to 1112 deg. F.) the melting point drops due to formation of cyanate and carbonate and the bath becomes suitable for cyanide treatment of high speed steel at 550 to 600 deg. C. Surface hardnesses as high as 1150 to 1200 V.P.N. have been recorded on 18-4-1 steel treated (after hardening at the high heat) in baths containing 50 to 60 per cent NaCN, the balance being cyanate and carbonate. These hardnesses were, however, obtained under a 1-kilo load and may not be quite accurate.

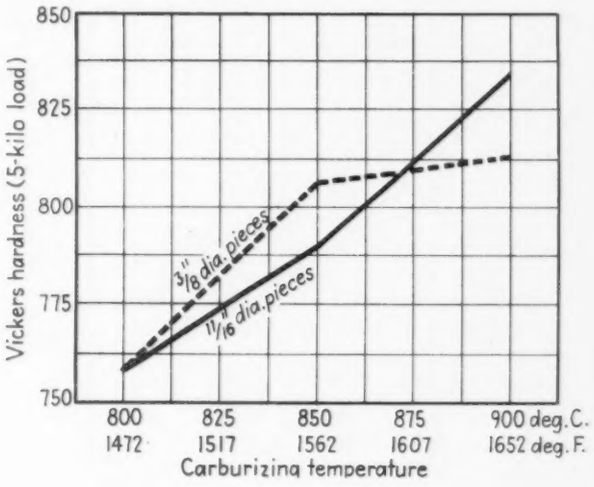


FIG. 8—Variation of hardness of S.A.E. 1015 steel carburized to the same depth (0.010 in.) at different temperatures. Bath strength 43 to 45 per cent NaCN.

TABLE V

Treating S.A.E. 1015 Steel at Various Temperatures

Carburized in 43 to 45 Per Cent NaCN Bath to 0.01 In. Depth at:	Quenched in	Vickers Hardness On Case (5-Kilo Load) $\frac{3}{8}$ in. Diameter Pieces	Vickers Hardness On Case (5-Kilo Load) $\frac{11}{16}$ in. Diameter Pieces
800 Deg. C.	Oil	725, 780, 765	690, 675, 660
850 Deg. C.	Oil	775, 810, 835	690, 690, 700
900 Deg. C.	Oil	795, 835, 810	765, 765, 770

Ed. Note:—Next week the author will conclude with descriptions of core properties of steel treated in cyanide, case hardening of malleable iron in cyanide, distortion, cyanide bath economics, etc.

How Cost Accounting

By EUGENE CALDWELL
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UNFORTUNATELY almost everyone in business feels he has a fairly complete knowledge of cost accounting, which will enable him to determine costs accurately in almost any situation. As a matter of fact, cost accounting is a profession in itself.

Therefore, it is not suggested that the facts regarding cost accounting set down in this article, when absorbed, will make one a cost accountant. Rather it is intended to outline some of the basic principles of the subject and by pointing out its complexity warn the executive that experts are needed in order not to secure false impressions of costs in many situations.

Most industrial establishments do not have adequate cost systems or in fact any definite knowledge of costs in their plants. No company can be intelligently managed without very definite knowledge of the costs involved. Lack of cost control and of knowledge of various items of cost were listed as some of the outstanding wastes in industry by the American Engineering Council in its survey in 1921.

This does not mean that every business regardless of size can justify a complete cost system. Such a system causes considerable clerical work. No more complex a system should be established than will be made use of, and it is quite possible to get accurate costs without a complete cost system.

There are two types of cost systems. With statistical costs, the cost of each job desired is figured up independently of the books of account. In other words the cost figures do not enter into the regular financial accounts in any way. The other type of cost figures carries all costs through the general books. By proper ledger segregations it is possible to secure almost any costs from the books themselves.

There is another classification of cost accounting depending upon the type of business involved. In the job order system costs are determined for each job or lot going through the plant. This is not possible in the continuous process industries, such as pig iron and paint manufacture, which have what is known as process cost accounting. The line between continuous process industries and job order industries is not always clearly drawn.

In a job order industry costs may be desired on a number of different bases, each of which may give a different cost. Costs of a department may be desired in order to present a report to the foreman believing he will then cut down the items over which he has control. Costs of a particular job may be desired in order to determine what to quote. Costs of a group or line of products may be needed to determine if money is being lost on the line or not. Then, comparative costs may be required for alternate methods of manufacture. If costs are being prepared to determine if a product should be manufactured or purchased outside, bare costs must be used without considering overhead or at least the portion of the overhead that would not be changed in any way whether the job is manufactured in the plant or not. That is to say, if no additional machinery must be purchased, no additional supervision will be needed, or no other elements of overhead added by manufacturing the part, then no overhead should be added in arriving at a cost for comparing with a quotation for making it outside.

Costs nearly always consist of three elements—labor, material, and overhead. There is usually nothing much complicated about figuring the cost of labor on a particular job, that is if accurate time tickets or job order tickets are available. However, a sharp distinction should be drawn between direct labor and indirect labor. Indirect labor is defined as that portion of the labor that cannot be allocated to any definite job. Therefore it must be charged into the general overhead. Examples of such labor might be crane operator's time, maintenance man's time, etc.

Very little complication arises either in connection with material, provided adequate inventory records are kept. Nevertheless it is often difficult to determine just how much material was used on a particular job. The credit to allow for scrap often presents puzzling problems, too. This will be mentioned later. Sometimes raw materials are purchased at a given price for an assortment, and when the various grades are sorted out each grade should be given a different cost, assuming that one grade is more valuable than the other. Here some intelligent segregations of cost must be made such as in proportion to the final selling price of the different grades.

Care must be taken to charge out material used for maintenance work, for example. This corresponds to indirect labor and should be charged to overhead.

Overhead is the item that usually offers the most complexity in any cost system. It is rarely possible to get the

Increases Profits . .

item of overhead allocated exactly to individual jobs.

There are various methods of allocating overhead to the job in different cost systems. One system bases the charge for overhead upon the hours of direct labor. This is objected to in some cases because the same overhead is charged for a 50c.-per-hr. employee as for a $1-per-hr. employee. To overcome this a second system charges overhead according to the direct labor dollar.

Another plan is to base the overhead charge on the cost of the material used. Still another plan is to value each machine in the plant at so much an hour, which includes overhead.

Still another system is to base overhead on the prime costs of the job, or in other words the total of the labor and the material. This is generally used in a few industries.

No one system can be said to be superior to another for all cases. That system should be picked out which is best suited to the individual plant. An attempt should be made to base the charge for overhead on the item it varies with most nearly. If in a particular industry a large quantity of material requires more supervision, power, etc., on a job than one requiring a small quantity of material, then perhaps the overhead should be based on the value of material used or the quantity (weight) of material used.

If on the other hand supervision on a job seems to vary according to the amount of labor involved, then overhead should be allocated according to the labor hour or labor dollar as best suits the case. By far the largest number of cost systems base overhead as a per cent of the direct labor dollar.

Regardless of what system is used the allocation of overhead should frequently be compared with the total cost

IN order to lower expenditures and eliminate waste, an accurate knowledge of costs is absolutely essential. Wrong and inaccurate costs are misleading and worse than no costs at all. The desirability of an adequate cost system designed to meet the needs of a particular plant cannot be over-emphasized, and a rough draft of such a cost system is given by the author herein.

of overhead. This comparison should certainly be made at least once a year. For example, the total cost of all items entering into overhead for the year should be obtained. Then, if a percentage of direct labor costs is used as a basis, the total direct labor costs for the year should be divided into the total overhead figure. This will give the percentage of overhead to add to each job. Or, if the overhead is to be based upon machine hours, the total overhead for the year should be divided by the number of machine hours per year; this will give the amount to add to the machine hour for each job.

It is a sorry statement to make but many firms throughout the country have been using the same overhead percentage for a number of years without change or without even checking. Some years ago someone determined that 150 per cent of the labor costs should be added for overhead, and that figure has been used ever since. Maybe there was no basis for this percentage in the beginning. At any rate it is unreasonable that the same percentage should hold true through a number of years without change.

In the kind of cost system that is carried through the books, the application of overhead rates, regardless of the system used, always leaves a surplus or a deficit. In other words the application of overhead to the different jobs throughout the year never comes out even regardless of how carefully a budget of production and expenses was set up. This causes an account called "Overapplied Burden" or "Underapplied Burden," which is added in with sales expense on the profit and loss statement. Some firms even carry this account over from one period to the other, in which case it appears on the balance sheet. There are two reasons why the application of overhead never comes out as anticipated. In the first place the actual overhead expenses themselves are never exactly as anticipated. Secondly, the production is never exactly as forecast. If overhead is allocated according to direct labor costs and business has not been as good as expected, then all the overhead will not be applied at the end of the year because there has not been as many labor dollars as anticipated. On the other hand if business is better than expected, there will be more jobs to apply the overhead to, and at the end of the year more than the actual overhead will have been applied.

A great many items of overhead are difficult to divide in a logical manner to the department involved. If a foreman is in charge of one department only, then of course his salary should be added to the overhead of that department. Likewise the superintendent's salary should probably be divided between the various departments equally unless some other basis more in keeping with the time devoted to each department can be determined.

But some indirect labor is difficult to allocate because it is hard to tell how much time is spent in each department.

Other overhead items are easy to segregate provided there is some method of measuring the amount supplied to each department. For example the most accurate method of allocating light and power would be to meter the amount at each department. However, very few plants have such metering equipment, and the matter is seldom important enough to justify installation of expensive measuring devices. The next best way perhaps, is to determine the wattage of the lights and the horsepower of the motors installed in each department and allocate the total power bill on this basis.

Other items should probably be most logically allocated on the basis of square feet in the department. The following is a list of some of the overhead items and a suggested method of allocation to specific departments:

Overhead Item	Suggested Basis for Allocation
Supervision	Divide equally or between departments supervised or number of employees.
Indirect labor	Divide equally or between departments supervised.
Heat	Square feet of installed radiation.
Light	Wattage installed.
Power	Horsepower installed.
Water	Equally between departments where used or according to pipe size.
Maintenance—equipment	Value of installed equipment.
Maintenance—building	Square feet of area in department.
Insurance—fire	Square feet of area in department.
Insurance—compensation	Payroll of department.
Taxes—real property	Square feet of area in department.
Taxes—personal property	Value of installed equipment.
Depreciation—machinery	Value of installed equipment.
Depreciation—buildings	Square feet of area in department.
Miscellaneous supplies and expense	Square feet of area in department.
Rent	Square feet of area in department.
Hospital expense	Number of employees.
Lunch room expense	Number of employees.

Special cost accounting problems are presented in property accounting for joint products and by-products. Joint products arise when two or more products are produced from the same raw material and neither product is subordinate to the other in the eyes of the business. By-products arise under the same situation, but are subsidiary to the main product.

Joint and By-Products

Frequently it is difficult to determine if a product is a joint product or a by-product, but if the second product is considerably lower in relative sales value, it is usually considered a by-product. With joint products the one cannot be produced without the other. For example, the pork processing division of a meat packing plant always produces hams, bacon, sausage, etc.

There are three methods of accounting for joint products: (a) average cost method; (b) quantitative method and (c) weighted average method.

With the average cost method the total output is divided into the total cost to find the average cost per hundred board feet of lumber or per hundred weight of meat. With this method profit cannot be determined accurately for any particular product.

Under the quantitative method an attempt is made to apportion the total cost to the individual products on the basis of quantity or volume. This method can be used only if all products have the same unit such as feet, pounds, gallons, etc., and only if the various joint products require individual processing after separation.

Where the quantitative units are not the same for the products, it becomes necessary to use the weighted average method. With this method the quantity is weighted by the market value of the products and the costs are allocated in this proportion. This is used extensively in lumber and oil refineries.

There are four methods of accounting for by-products, as follows:

(a) treat as other income; (b) treat as a reduction in cost of main product; (c) treat by-product as having no cost at time of separation but charge by-product with all costs after separation; and (d) record cost of by-product before and after separation.

The simplest method of accounting for by-products is to treat sales as other income. This is the same as if the by-product were scrap material, and where the value of the by-product is small, this treatment suffices.

The second method treats the sale of by-products as a reduction in the cost of the main product. Under this theory the by product is considered unavoidable and in the nature of waste. Where the value of the by-product is not great, this method is satisfactory.

The third method is used only where the by-product requires further processing to place it in a marketable condition after it is separated from the main product. The by-product is charged only with the costs of the additional processing. It overstates the cost of the main product and understates the cost of the by-product but is used for practical reasons rather than theoretical accuracy.

The fourth method is the most accurate of all and accounts for the cost of the by-product before and after separation from the main product. It is justified where the value of the by-product is relatively high, but obviously the expense of keeping the more accurate costs is greater. The method of accounting for costs before separation is exactly similar to joint product accounting previously described.

The accounting for waste and scrap is about the same as has already been mentioned under the first two methods of by-product cost accounting. Scrap usually refers to unusable parts of the raw material left over from production. Generally it has some salvage value as contrasted to waste which ordinarily has no value. As a matter of fact sometimes waste costs money to dispose of it. In other cases waste disappears in the process or evaporates into the air.

Process Cost Accounting

So far in this manuscript the discussion has been centered around job order cost accounting. In some industries another form of cost accounting is necessary and is known as process cost accounting. This is used in industries where production is a continuous process and not divided into jobs or orders. The line of distinction being a continuous process industry and job order industries, is not always a sharp or well-defined one. Some companies are on the border line where either kind of cost accounting could be used, depending upon which best supplies the needs.

Examples of continuous process industries are blast furnaces, cement plants, paint manufacturing, glass plants and the like. Raw materials are placed into production in almost a continuous stream, and the finished product is drawn off either in batches or in more or less of a continuous flow. Many companies in the food industry have production of this type.

Here cost accounting must be handled in an entirely different manner. Instead of specific jobs, costs are based upon a period of production, such as a month, or upon batches. Unit costs generally based upon weight, as for example per pound, are determined.

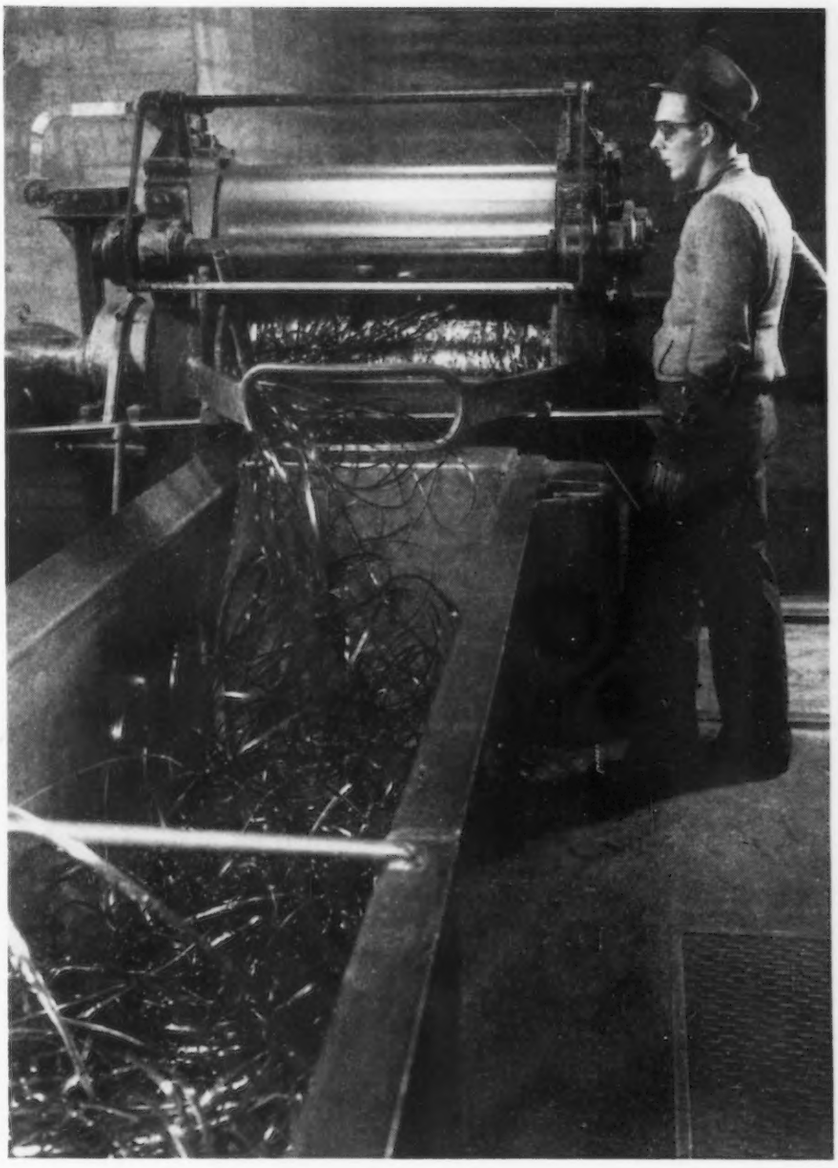
Great complications frequently arise in determining the value of the inventory still left in the process at the time of determining the costs, particularly when there has been any loss or wastage between processes. It is first necessary to account for the units placed in each process, the amount taken out as finished, and the amount still remaining unfinished during the period for which costs are being determined. For example, 1000 lb. of each of two different kinds of raw material may have been put into the process and 1500 lb. of finished product, leaving 500 lb. of work in process.

The material costs can usually be determined directly from the schedule of units placed into each process. However, in order to account for the labor costs it is necessary to prepare another schedule known as equivalent production. This comes about because the units still in process have not had their full measure of labor performed upon them. For example, the 500 lb. just mentioned may have had only 10 per cent of the work done in order to finish them. This would make only 50 "equivalent production" units instead of 500.

The overhead is applied according to the basis in use for the particular company. In other words if overhead is based upon material used, the regular schedule of unit weights is used. But if overhead is taken as a percentage of labor, then "equivalent production" units must be used.

To arrive at an accurate cost per pound of finished product during a particular month is a real job for a cost accountant if there is any complication in the work-in-process, wastage, by-products or the like.

There is another form of cost accounting known as standard costs. An attempt will not be made to cover this system in this general discussion inasmuch as it is a separate subject in itself. Standard costs are set up for each product by means of time studies and various other determinations before the items is placed into production. Variations from these standards are kept, and the actual costs are thus compared with what they should be or the standards.



THE simplest method of accounting for by-products is to treat sales as other income. This is the same as if the by-product were scrap material. Where the value of the by-product is small, this treatment suffices. However, there are three other methods of treating the sale of scrap or by-products.

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Still another form of cost accounting is known as estimated costs. This system is handled the same as the standard cost system in that both standard costs and estimated costs are determined in advance of production. However, standard costs are scientifically determined and represent what the cost should be; whereas estimated costs are simply estimated as accurately as possible from past production or other data, no scientific studies being made. With estimated costs the actual cost is presumed to be the correct cost. With standard costs the actual is simply a variation from the correct cost or standard. Estimated costs are used in industries where selling prices must be determined long in advance of production, as for example in the clothing industry.

Uniform cost accounting has received considerable attention in recent years. Uniform systems are worked out for an entire industry usually by the trade association involved.

Welding of Cast Iron

By L. TIBBENHAM

THE author covers herein the various problems encountered in the welding of cast iron, and describes in detail several techniques that have resulted in satisfactory welds. This is a paper which was recently read before the East Anglian section of the Institute of British Foundrymen, H. H. Shepherd presiding. Reprinted by courtesy of the *Foundry Trade Journal*.

SOME years ago it was considered impossible satisfactorily to weld cast iron owing to its peculiar structure, but recent evidence disproves these theories. At the outset it must be realized that the welding of such a complex iron-carbon alloy as cast iron is essentially a metallurgical operation, and in consequence must be treated as such.

Thus the fundamental problem which confronted metallurgists was to discover what structural or chemical changes were actually obtained after welding. Experiments were conducted with a filler rod having a chemical composition very similar to that of the parent metal. After welding, however, it was found that the analysis of the deposited rod metal had changed, the silicon and manganese contents having decreased while the combined carbon had considerably increased. The resultant weld was naturally hard, due to the cementitic structure, the Brinell hardness being of the order of 360.

In order to produce a softer weld it was, of course, found necessary to increase or decrease certain elements contained in the rod, and a rod of the following analysis was found to produce a soft machinable weld: T.C, 3.25; G.C, 2.75; Si, 3.00; Mn, 0.50; and P, 0.60 per cent.

Much has been said about the welding operation affecting the strength of the parent metal, and hence heat treatment both before and after welding was regarded as being of paramount importance. That is to say, it is generally advantageous to pre-heat the entire article to be welded. As this is often not practical, it has been found sufficient merely to preheat a reasonably large area in the zone of the weld.

Such preheating is necessary to ensure that the heat from the blowpipe flame is graduated evenly throughout the parent metal. Without preheating, it was found that there was a zone outside the line of welding possessing a considerably altered structure, easier to fracture than the deposited weld metal, or the original parent metal itself.

Cast iron is such a complex material that, when cooling from the liquid state, it is not of the same structure internally just after solidification as it is at room temperature. Several changes occur at definite temperatures during the cooling down. The different phases, as the changes are called, have different densities, i.e., a casting at 1652 deg. F. has a different volume from the same casting at 1292 deg. F. and again a different volume at 932 deg. F., quite irrespective of the normal thermal contraction due to fall of temperature alone. These transformations occur at approximately 1112 deg. and 1382 deg. F. for ordinary cast iron.

The rate of cooling determines whether the phase changes are partial or complete. It will, therefore, be readily seen that unless the rate of cooling of a part after welding is identical with that of the casting when originally made, its structure will not be the same and its volume will be greater or smaller. Identical cooling conditions never obtain in practice, and some part of the weld and adjacent metal is of greater or less volume than it should be, and if this part is not "free," stresses are set up, often leading to fracture. The exact opposite occurs in heating up a casting. This trouble and risk are greatly minimized by preheating the whole of the casting before welding, and cooling slowly afterwards.

The great advantage of bronze welding of castings is that the transformation points mentioned are hardly reached during the welding process and so these additional stresses are not set up.

The difference in volume before and after heating above the critical temperatures mentioned is called grain growth. Where grain growth and thermal expansion are spread over the whole casting uniformly (as in correctly preheated jobs), there is no danger of fracture during or after welding, as the growth of one part compensates for that of another.

Internal Cracks

All ferrous alloys, when subjected to high temperature in the presence of air or oxygen, tend to scale. This is due to oxidation taking place externally and also internally. This in turn arises from the fact that cast iron carries graphitic interstices in its formation, and that the gases can therefore penetrate into the interior of the metal.

The graphite cavities provide the means for this permeation and, therefore, oxidation takes place in them This results in a subsequent increase in volume, and as this material is not free to expand, internal cracks are set up adjacent to the graphitic cavities. If the action be continued, the crack will extend and permit of further oxidation along its own line; hence the action is cumulative until fracture takes place.

From the above explanation of internal cracks it becomes clear that there are several conditions to be avoided when welding. These include: (1) Prolonged heating and repeated

heating; (2) an oxidizing welding flame; and (3) preheating methods which cause oxidation.

Preparation

It is of vital importance that the casting be properly prepared, as no matter how skilful the operator, he would have a practically impossible task unless he made proper preparation. The part to be welded should be veed through practically its full thickness by grinding or chipping. The welding repair is not merely a question of depositing metal on the surface, and the operator has not only to think of obtaining good penetration and a weld free from slag, hard spots, or gas holes; he must also have considerable knowledge to foresee the after-effects of the welding operation, and the possibility of further cracks being caused by the expansions or contractions which are set up, not only during the welding process, but after the casting has again been put into work. In fact, he should visualize the casting in its working condition.

A very searching inspection must be made after the welding operation, as many operators approve of their welds when, perhaps, on a more careful inspection, small, thin and extensive cracks are found close to the edges of the deposit and the parent metal. These small cracks are very serious and must be absent, for they nearly always develop into serious defects. They are the evidence that high contraction stresses are being exerted across the weld.

Methods of Preheating

Preheating may be accomplished by the use of the blowpipe flame itself, by preheating blowpipes or burners using coal gas, by special preheating furnaces, or by furnaces temporarily built up of loose firebricks within which a charcoal fire is made. A disadvantage of coke fires is that sulphur fumes cause very weak weld metal; furthermore, the heat is usually too intense in one part only. The simplest form of preheating is with the welding flame, before and during the actual welding work.

In the case of jobs where the two parts to be welded are, so to speak, free to move, the blowpipe flame may be directed upon the parent metal on each side of the weld, so preventing the cool parent metal from chilling the molten metal in the weld. Welders should beware of thinking that this method is adequate to preheat any but the simplest structures of the kind indicated, as it is obviously only a rough method, and it is not easy in this way to ensure that a uniform heat is kept up at the points where this heat is necessary.

The most useful form of preheating apparatus, where coal gas is not available, is the loose firebrick furnace with a charcoal fire. This furnace has a wide range of adaptability, since it can be made to accommodate parts of any size. Charcoal burns slowly and provides an even temperature. It burns without the need of air bellows, and is practically sootless and smokeless in combustion.

Welding Technique

The welding of cast iron needs more careful thought than the welding of rolled or wrought metals, and due consideration must be paid to various factors which ultimately affect the finished work. The size of blowpipe tip is determined by the mass of the metal and not necessarily by the thickness of the particular section where welding is required. Another factor to be borne in mind is the extent of preheating.

It naturally follows that where a casting is preheated to a high temperature, a smaller blowpipe tip can be used; but generally it is a decided advantage to use a blowpipe tip one size larger than is used for steel of corresponding thickness, and to obtain a soft flame, *i.e.*, to use slightly reduced pressures on both gases. The flame should be strictly neutral and never oxidizing. Cast iron welding should be completed as quickly as efficiency will allow. The less the flame and rod are removed from the weld the better, and slow weld progress results in the burning out of certain valuable elements—carbon and silicon—from the weld metal.

In contradistinction to wrought iron and steel, the melting point of the oxide of cast iron is higher than the melting point of the metal; therefore a good flux should be used to reduce the oxide and allow the clean metals to intermix. In welding cast iron, first fuse the bottom of the vee and then the sides, using a semi-circular movement of the blowpipe and so forming a molten pool. The welding rod, suitably coated with flux, should be dipped into the pool and sufficient rod melted to achieve the desired flush or reinforced finish. By blowpipe manipulation the pool should be progressively moved along the line of welding, adding the filler rod as required. On no account should the filler rod be melted by the flame alone; contact with the molten pool should be sufficient to melt the rod without directing the flame on to the rod. A puddling motion may be given to the filler rod in order to bring impurities to the surface, but this procedure must not be overdone, otherwise the metal will be unduly stirred, bringing fresh metal to the surface and submerging more oxide.

After-Treatment of Welds

Immediately after welding, the surface impurities and flux should be removed with a coarse file or rasp. Cast iron welding technique requires that the small cone in the flame should be kept distant from the molten metal by ⅛ to ¼ in. This cone should never make contact with the molten metal, otherwise hard spots will result. The after-treatment of a weld has a great deal of influence on the mechanical properties produced. In all cases rapid cooling must be avoided at all costs. If the articles are small, they can be dropped into any suitably heated receptacle to keep them away from the action of cool air.

It is of great importance that the welding rod should have the most suitable chemical composition for the work for which it is required. Its surface should be free from oxide or other foreign matter, which will have deleterious effect on the physical properties of the weld. More bad welds are produced by using dirty and unsuitable rods than any other fault. The chemical analysis of the rod should be as near as possible to the article being welded, but must normally contain an excess of silicon to allow for losses of this element in welding.

It is also of the highest importance to use the flux which is specially manufactured for each particular rod. Actually the flux is required to perform the following four functions: (1) to clean the metals—both rod and parent; (2) to assist the flow of the molten weld metal; (3) to remove slag from the molten deposit, and (4) to prevent hard spots.

Low-Temperature Welding

In this method of welding cast iron, the parent metal is not melted by the blowpipe at all, it is only heated to a bright red heat; then the molten iron from the filler rod flows over the surface, and melts and fuses perfectly with a thin film of the parent metal. A special rod is used together with a paste flux and a new technique. The casting is prepared in the usual way, as for fusion welding. The sides of the vee where it is desired to begin the weld are next brought to a bright red, using a strictly neutral flame and

a blowpipe tip one size smaller than that used for the ordinary method of welding material of similar section. The end of the fluxed special cast iron rod is then brought into the flame and a drop melted off and allowed to fall onto one side of the vee. If the parent metal is at the correct temperature, this drop spreads out over the surface of the parent, melts a thin film of it like warm water poured on ice, and fuses perfectly with the parent. More drops from the filler rod are then added and the weld proceeds in a leftward manner, the rod and the blowpipe being positioned in the way described.

Bronze Welding

Bronze welding is extensively used for the repairing of cast iron, and offers many advantages over other methods by its speed, economy, and the possibility of doing jobs which would otherwise be impossible. There is quite a definite union between cast iron and bronze—an actual penetration of the weld metal into the cast iron and graphite voids in the cast iron surfaces, which are filled up.

Bronze welding is not a fusion weld or a braze, but a surface alloying process. The bronze is added in the form of a bronze rod in conjunction with the oxy-acetylene flame, and the operation is easily controlled; in fact, it is possible to produce a joint equal in strength and reliability to a fusion weld, and this can generally be carried out with very little preheating and often without dismantling the part. If the article to be welded is very large, it may be advisable to arrange for some local heat to be applied adjacent to the weld; this can generally be applied with the blowpipe itself.

Preparation for Welding.—After the sections have been veed or bevelled, it is necessary to heat the veed faces to a dull redness (752 deg. F.) with the blowpipe prior to the welding operation. That is necessary as the graphite flakes, which are exposed during the veeing operation, are removed and, in consequence, the tinning action of the bronze is not impaired.

Bronze welding should be conducted at a medium red heat. If the parent metal becomes too hot, the bronze will apparently boil, and globules will be formed which will run off the parent metal as fast as the rod is added. If the metal be too cool, the tinning action will not take place satisfactorily, and the speed of the operation will thus be retarded. It has been found that the majority of operators make the mistake of using too large a blowpipe tip when attempting to weld with a bronze rod.

Welding Flame.—A slightly oxidizing flame has been found by experiment to give the best results, the flame being obtained by adjusting the blowpipe so that the inner cone is slightly shorter than when the blowpipe is set for a neutral flame. Great care should be taken to ensure that this adjustment is kept constant.

Flux.—To obtain the greatest success in bronze welding it is essential to use a good flux, that is to say, one which will unite with any oxides remaining on the surface of the vee, and will greatly assist the tinning action of the bronze. Not only does the flux clean the metals, but also slags resting on the surface of the molten weld puddle, thus preventing further oxidation of the bronze during the welding process. It is necessary to add the flux continuously and prior to the welding operation, and it has been found advantageous to sprinkle a quantity of flux on to the heated vee prior to the application of the rod.

Tinning of Cast Iron.—The vital point of the whole operation is the tinning of the parent metal with the bronze. The heated bronze when applied to the heated parent metal—at the correct temperature—will flow like water, a very thin layer of bronze being deposited. The edge of the weld puddle will not roll like oil on glass but will tend to spread itself and flow freely under the blowing action of welding flame. The forehand technique should be utilized and the flame and the welding rod should be manipulated so as to produce a distinct ripple effect on the surface of the completed weld.

The most important point during the whole operation is the tinning, which should take place in advance of the front of the puddle at all points throughout the whole operation. The inner cone of the slightly oxidizing flame should be kept about ¼ in. away from the surface of the puddle, and, finally, welded joints in cast iron should be protected from sudden draughts during the time of cooling from dull red heat to normal temperature.

Discussion

A. Gilson raised the point of grinding *versus* chipping when preparing the V-groove for the path of the weld.

Mr. Tibbenham recommended chipping because it offered a better key for the filler metal. Grinding tended to close the grain of the iron and might also cause surface oxidation.

L. E. Slater mentioned the salvage of waster castings by means of welding and asked why castings so treated were often unmachinable at the welded place.

Mr. Tibbenham replied that this trouble ought not to occur where annealing followed the welding treatment. Sand inclusions in the welding rod would cause hard spots, but the presence of sand was usually disclosed by the appearance of red spots on the weld which could be puddled out by the operator.

J. H. Prodger said that, for salvage of waster castings, if the defect were discovered while the casting was still hot from the mold, matters were very greatly simplified. The weld could be made right away, preheating was obviated, slow cooling followed and the chance of failure was practically eliminated.

J. L. Francis inquired if the welded part was as strong as the parent metal, and how oxy-acetylene welding compared with electric welding.

Mr. Tibbenham said the welded part should be as strong as the parent metal and when the weld was made with bronze rod it was stronger. Electric welding tended to give a harder weld and heat could not be applied to the job as could be done with the torch when oxy-acetylene welding, without actually adding metal to the weld.

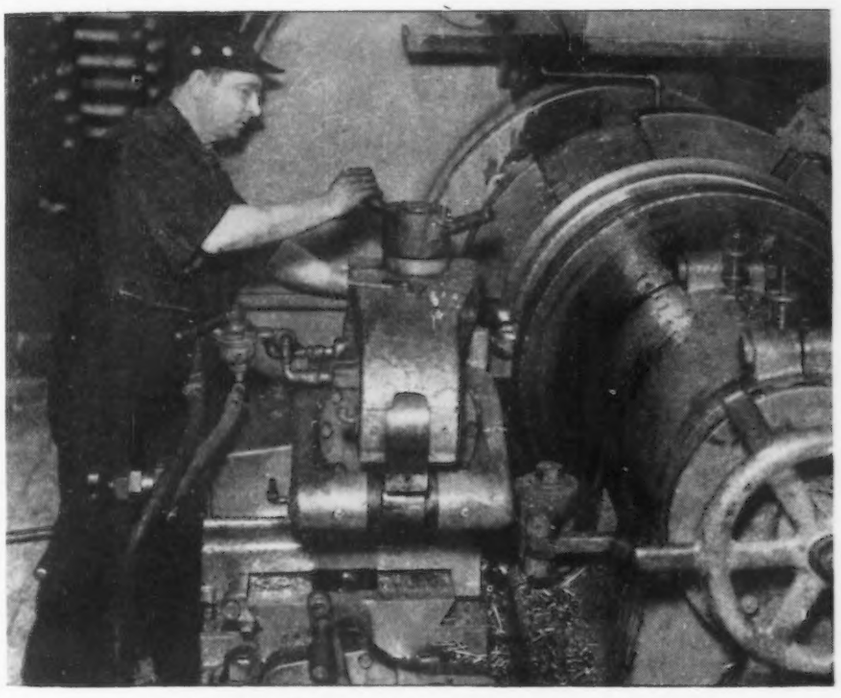
J. H. Prodger said that blowholes in the weld could be prevented by keeping the flame over the weld continuously during the welding operation.

H. H. Shepherd thought Mr. Tibbenham had not stressed sufficiently the advantage of bronze welding in effecting repairs *in situ*, a very important asset for mechanized plant. He also expressed the opinion that welding with bronze filler rods was a development of brazing, which was a very old system of joining metals. Another point which had not been raised was the question of weldings *versus* castings. In this respect the valuable attribute of cast iron in damping out vibration must be considered. Mr. Shepherd also mentioned some research work which had been done on the welding of blackheart malleable cast iron. In most cases the ductility, as measured by elongation, was destroyed and the tensile strength was lowered, when welding with cast iron or mild steel filler rod. Using bronze rod the elongation obtained was about 2 per cent.

Bethlehem Develops New Tool Steel

A SPECIAL high-carbon, high-vanadium tool steel said to be suitable for a wide variety of uses, ranging from heavy hogging cuts to fine finishing operations, has recently been developed by Bethlehem Steel Co. The new steel, marketed under the name Red Tiger, represents a departure from standard practice in that the carbon content has been markedly increased to give extra hardness, an average R_c of 65 to 68 after heat treatment. It is said that this has been attained without excessive brittleness. Physical tests show impact properties which are approximately the same as those of standard carbon 18:4:1 high speed steel.

The shock resisting properties makes it possible to use this steel on intermittent cuts without danger of breaking the tool. Due to the high carbon content, it also lends itself well to fine finishing operations, producing a surface comparable with that obtainable with the old type finishing steels which can only be run at low speed. Good red hardness values make it suitable for heavy hogging cuts.



Machining a 30-in. car wheel. Note the size of the chip.

The analysis of the new steel is approximately as follows: tungsten, 18 per cent; chromium, 4; vanadium, 2.5; molybdenum, 0.60 to 0.80; carbon, 1.00. Standard heat treatment, without any extra precautions, is used. The following is the recommended treatment: Preheat the steel slowly to between 1500 and 1650 deg. F and soak thoroughly. Transfer to the hardening furnace, heat rapidly to between 2350 to 2375 deg. F and oil quench immediately to about 200 deg. F. Allow to cool to room temperature, charge into a tempering furnace and draw to 1050 deg. F. If properly followed, this hardening procedure will give a R_c hardness between 65 and 68.

The principal applications include machining, both roughing and finishing cuts for all general purposes, such as heat treated railroad car wheels and axles, cast iron, and heat treated alloy steel. In machining heat treated car wheels, a speed of 16 ft. per min. has been used with 7/16 in. depth of cut and 7/16 in. feed.

Temperature Measurements of Liquid Steel

EXPERIMENTAL measurement of temperatures of liquid steel in a basic open hearth furnace was described in a recent issue of *Jernkontorets Annaler*, by S. Fornander and T. Omberg. (From British Iron and Steel Institute.)

The authors describe the construction, calibration and use of two types of thermo-couples for determining the temperature of molten steel in a basic open hearth furnace. One thermo-couple was a Fitterer pyrometer with a graphic/silicon-carbide couple; its construction rendered it unsuitable, however, as it was not designed for the type of furnace used for the investigation. The second one was a tungsten-molybdenum couple with a water cooled sheath so designed that the difference in temperature of the water at the inlet and outlet never exceeded 95 deg. F. in spite of the uninsulated 2½-in. diameter iron tube forming the jacket.

In their discussion of the results obtained with the latter apparatus, the authors compare the carbon content/temperature curves for seven different melts and point out that differences as great as 338 deg. F. at the same carbon content were observed; this may have been due to the small size of the furnace, the capacity of which was about 12 tons. The authors also describe how they fitted a protective sheath of Pythagoras cement which enabled at least six determinations to be made without changing the element. The authors were unable to establish any definite relation between the tapping temperature and the behavior of the steel in the ingot mold.

Automatic Plating

By HERBERT CHASE

o o o

HIGHLY efficient plating procedures are a virtual necessity in any plant plating die castings in large quantities. They have been attained with a moderate investment in plating equipment, considering the quantity of work handled, in the new plant of the Alemite Die Casting & Mfg. Co., Woodstock, Ill. This plant is adjacent to an older one in which die castings have been produced and plated for many years.

A large proportion of the die castings made in the new plant are automotive parts, many of which are exposed to weathering in their plated form. They require both an enduring and attractive finish. Most of the other die castings produced for passenger cars are for interiors. They are plated, first with copper and then with nickel, whereas those for exterior use have an added coat of chromium over the nickel.

All the castings produced in the newer plant are in zinc alloy (S.A.E. No. 903) and those to be plated come from the dies with the surfaces to be plated very smooth. As a rule, except at parting lines, no grinding or polishing is required. Normally buffing makes the castings ready for plating.

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RIGHT

END of the copper-nickel plating tank line, where workmen unload racks of castings and transfer them to the chromium plating line.

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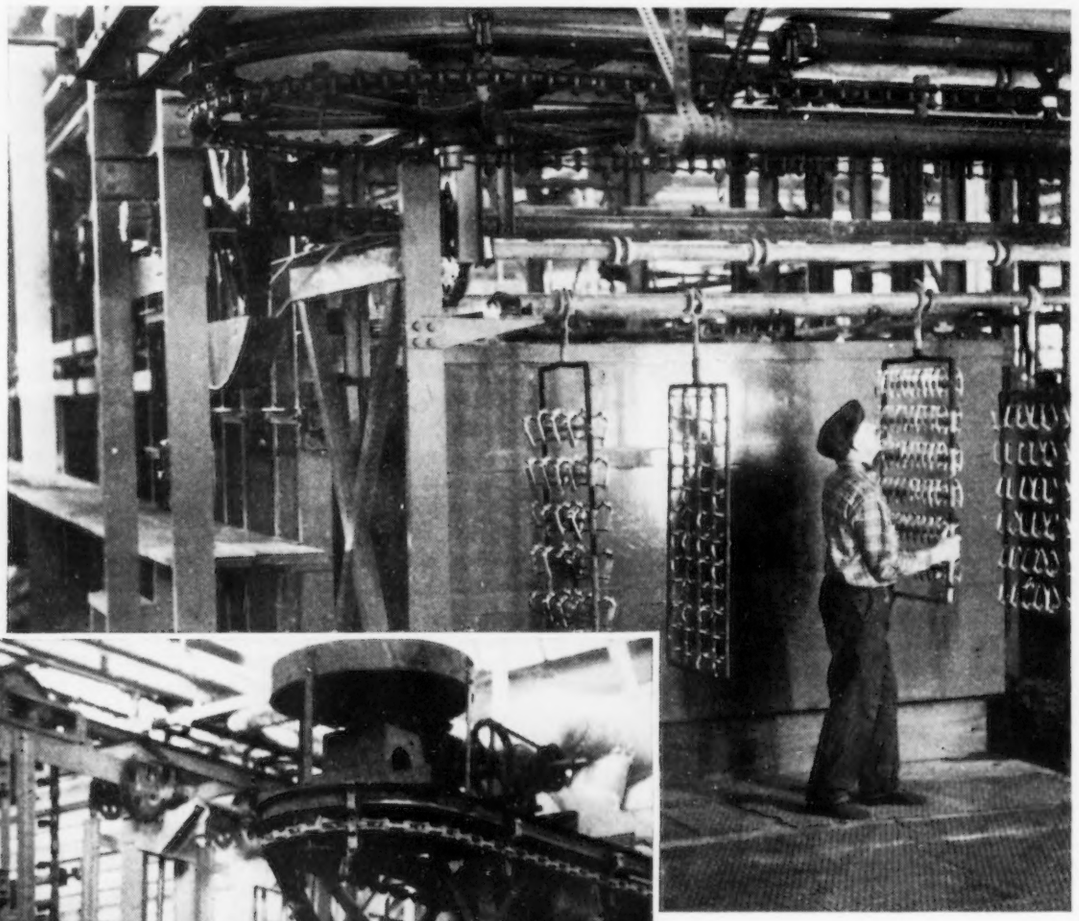

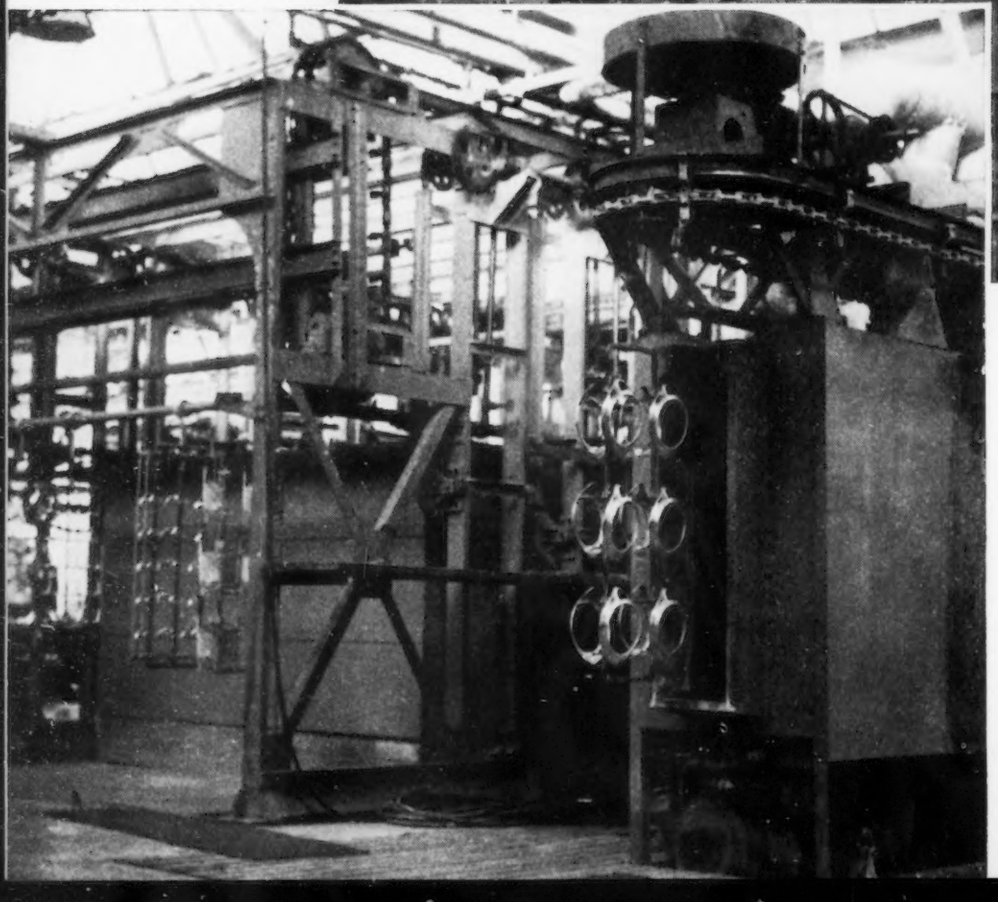

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AT LEFT

AT the right, racks of castings issue from a high-pressure spray cleaning machine and are ready to be hung on the bar conveyor (left), which carries them through copper and nickel plating tanks.

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# of Die Castings

Both copper and nickel plating are done on an automatic machine which carries the castings through a series of tanks arranged in a straight line. Plating racks are suspended from bars which are advanced by chains through a path such that the castings remain in the respective tanks the precise time necessary to produce the required results. All solutions used are subject to careful control and are checked as frequently as experience has proved it necessary to insure dependable and uniform results.

Castings arrive at the plating department after having received whatever polishing and buffing are required. The first operation is to place them in plating racks designed, of course, for the particular castings. Racks are then hung on a chain conveyor which carries them through a high-pressure spray cleaning process in which a mild alkaline cleaner, used hot, is employed. This removes oil and grease and such polishing and buffing compounds as have been used in prior operations. The chain conveyor makes a closed loop, the axis of which is parallel to the row of copper and nickel plating tanks extending nearly across the plant. The spray cleaner enclosure is less than half the length of the loop and covers only one side of the loop near one end, hence there is plenty of room for loading along the remainder of the loop.

As the racks emerge from the cleaning enclosure, they are adjacent to the end of the plating tank row where the bars of the plating machine travel beyond the end of the tank. There, the racks are unloaded from the cleaning line chain and are hung on the bars for passage through the plating solutions, rinsing and other dips. Copper is applied from a cyanide bath giving a coat of 0.0003 in. minimum thickness, and of sufficient brightness to form a good base for the bright nickel which follows. The latter is applied by McGean methods, using organic carrier and brightener, both of which are subject to the careful control essential for uniformly bright coatings. The latter are so bright that buffing prior to chromium plating (when the latter is to follow) or prior to shipment when the castings do not receive chromium plating is seldom required.

Chromium plating is done in a second row of tanks arranged parallel to the first row, but is efficiently carried out with a comparatively simple and relatively inexpensive method of handling. This is not automatic but makes good use of two overhead electrically operated cranes each carrying an electric hoist with controls at convenient height. The cranes, of course, move the copper rack carriers along the row of tanks horizontally and the hoists lower the racks into and raise them out of the respective tanks. Two operators, walking along the row of tanks, the tops of which are near floor level, can handle per hour about 30 carriers, each holding several racks of castings. Operators keep in step with the machine on the adjacent row of copper-nickel tanks which, however, handles more castings, since a considerable proportion of those nickel plated are not chromium plated.

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BELOW

STARTING end of the chromium plating line, showing a carrier from which several plating racks hang. Controls are handled by the operator as he walks under the crane along the row of tanks. The monorail overhead returns unloaded carriers from the end of the line.

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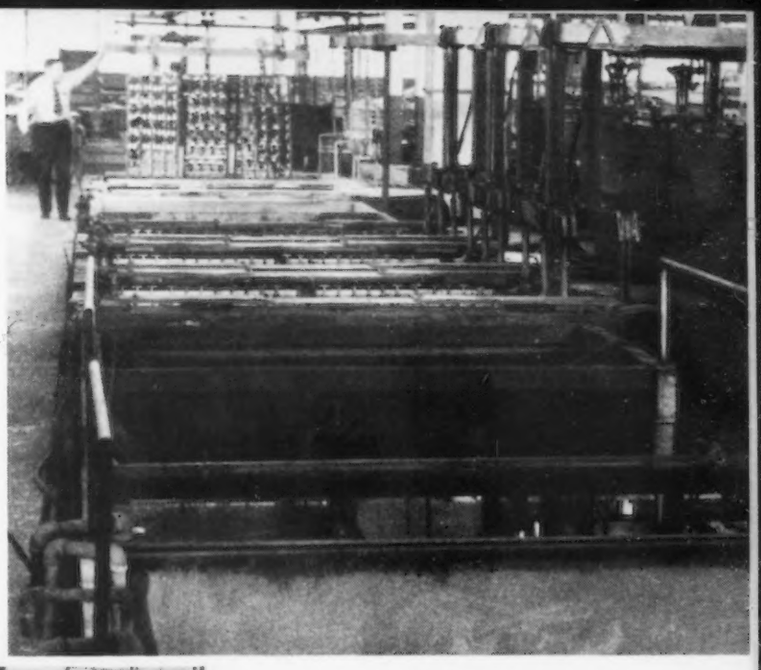
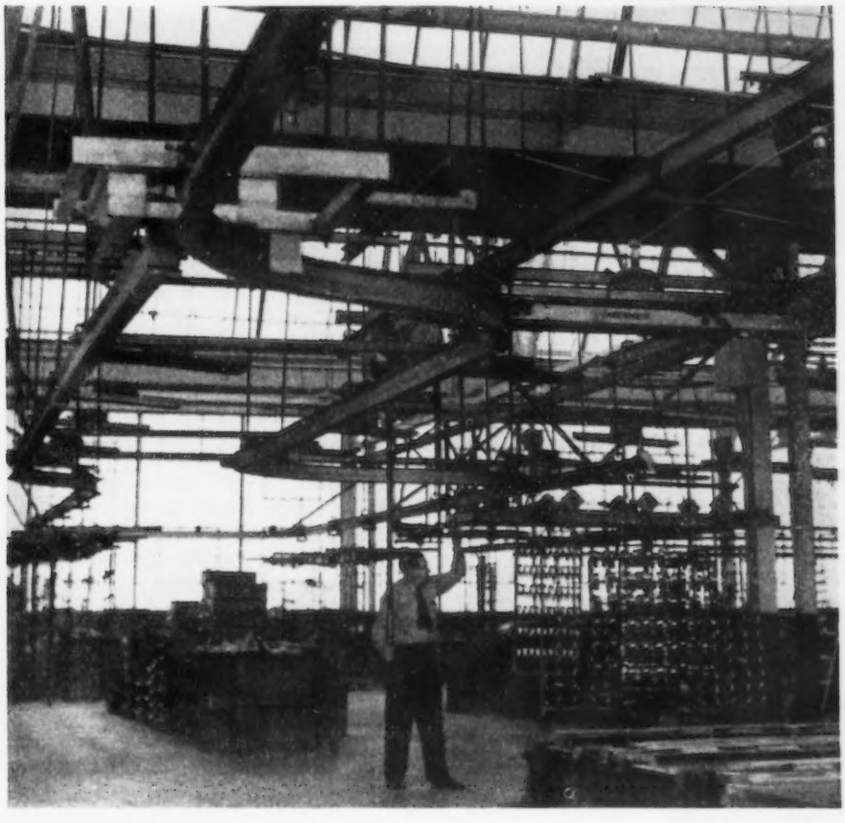
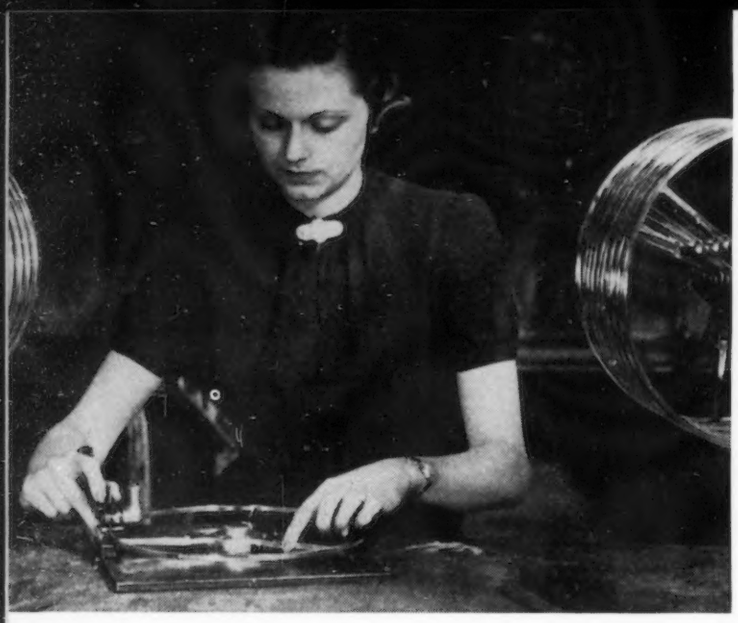




ABOVE

FINISH end of chromium plating line. The chromium plating tanks are those near the center, other tanks being for rinsing. Operator at far end controls the two traveling cranes which handle the carriers.

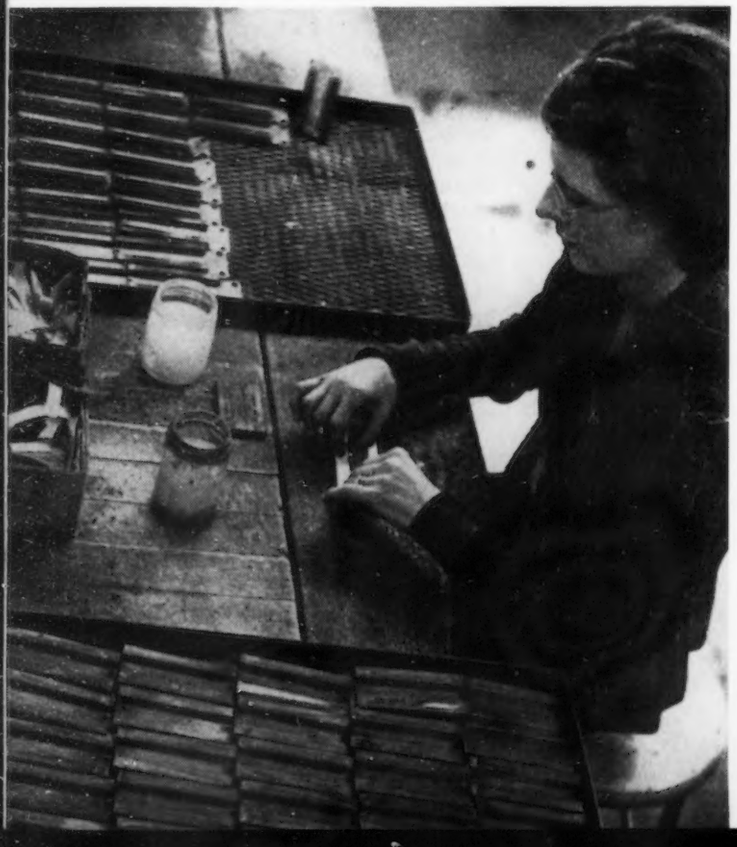


ONE of several hand operations in which stripes of enamel are applied to castings which have been plated. A die cast horn ring is rotated under a striping brush which applies the enamel in a recess provided for this purpose.

After the loaded racks emerge from the nickel solution, where a minimum of 0.0005 in. of nickel has been deposited on the parts, they pass through a series of rinses and are then transferred by hand to the carriers which are used for chromium plating. This is contrary to the usual practice of using separate racks for chromium and is made feasible by reason of a special cleaning treatment given to the racks when they come out of the chromium solution. Without this special cleaning the racks might carry some active chromium salts back into the copper and nickel solutions when they go through the cycle again.

Racks, of course, are well made and well maintained but considerable time and labor are saved by not having to re-rack after nickel plating and, of course, a smaller number of racks is required than would be needed if separate racks for nickel and chromium were employed.

Thirty carriers per hour are handled in the chromium line, making the cycle time 2 min. in length. But, as there are three chromium tanks in the line, the time of plating can be varied from 2 to 6 min. without interrupting the cycle. This arrangement is sufficiently flexible for depositing a minimum of 0.00001 in. of chromium on the various parts plated. Other tanks in the chromium line are chiefly for rinsing, with only a short period in each tank and, as the operators cannot exceed, by more than a carrier or two per hour, the average rate of about 30, timing becomes practically automatic. The layout is such, of course, that, while the respective loads remain in the chromium tanks, the operators are busy handling other carriers, hence, both they and the cranes they use are busy continuously.



OPERATOR applying a grained transfer to die castings for instrument panels after the castings have received a primer.

At the end of the chromium line, racks are removed from the carriers and the latter are shifted to a monorail conveyor which takes them back to the other end of the chromium line for repeated use. Carriers do not enter the solutions themselves, of course, but remain above their level, with only the plating racks dipping into the solutions. Castings coming out of the chromium tanks are removed from the racks for inspection and for any subsequent operations required and the racks are treated, as above noted, and are returned on a chain conveyor to receive a new load of unplated castings at the start of the copper-nickel plating line.

There is, of course, a change in the size and shape of some of the castings delivered each day to the plating department, since the number of any given casting on order varies. Racks have to be changed accordingly, and while some are out of service they are given whatever attention is required to keep them in first class shape.

Castings coming from the chromium line are bright, of course, and, in general, require no buffing, but when any castings have areas which are not bright, provision for buffing these areas is made so that the line need not be stopped while the cause of the lack of brightness is located and a remedy applied.

Many of the castings plated have certain areas or stripes which have to receive either a contrasting enamel or a decalcomania, or are lacquered in black on surfaces which are not wanted in the gray color where buffing has not been done. Such castings are routed either to spray booths, where lacquer is sprayed on, or to benches for hand stripping. Application of the decalcomania requires, for proper adherence over the plate, that a primer be first applied and baked on. Areas which are not to receive the primer are masked, of course, and when the primer has been baked and the decalcomania applied, the latter is covered with a coat of clear lacquer. Castings, such as grilles, in which only the front face is intended to be bright, are sprayed with black or aluminum lacquer from the back while the face is against a matching surface or is otherwise masked. Any lacquer which gets on the face is wiped off before it dries, using a soft cloth.

Many thousands of castings a day are put through the foregoing operations and the resulting product is not only fine in appearance, but the coatings are of such high grade that they withstand exposure conditions through many years of service.

Electroplaters Meet

—Fundamental and practical aspects of metal finishing, cleaning and rust proofing discussed at 28th annual convention at Dayton

THE 28th annual convention of the American Electroplaters' Society was held in Dayton, Ohio, June 10-13 inclusive, with headquarters at the Hotel Biltmore. The growth of this Society and the interest displayed in its work by the metal products manufacturing industry was evidenced by the largest registration in its history, over 600.

The papers were of a high order, the meetings crowded and the discussions warm.

The first paper, and as it happened, the outstanding paper of the entire week was "Metallurgical Aspects of Hydrogen in Electroplating," by C. A. Zapffe and C. L. Faust, of the Battelle Memorial Institute, Columbus, Ohio. This paper discussed the fundamentals of a problem which bore on electroplating, pickling and steel manufacturing alike. That the convention appreciated the value of their work was shown by the award of the $100 Herminie Dorothea Proctor Prize to the authors.

The tremendous effect exerted by hydrogen on metals was briefly explained and metallurgical data for hydrogen-metal reactions during acid pickling and cathodic electrolysis were presented to supplement those already known to electroplaters. The effect of hydrogen absorption by steel on electroplating was demonstrated by experiment to show that lifting and blistering and possibly poor adherence, may be caused by this gas through its effusion from the steel base at ordinary temperatures, and that occurrence of the defects is especially favored by heating. Effusion of the gas from the steel base during electroplating is a cause of gas pits, because it is difficult for metal ions to deposit over small holes through which gas is continually escaping.

Embrittlement and hardness of electrodeposits were discussed, and an explanation was afforded for the descaling action that occurs during cathodic electrolysis. Hydrogen absorption was shown to be severe during cathodic cleaning in either acid or alkaline solutions. Suggestions were made for preventing hydrogen-caused defects in electroplate.

Many electroplating processes favor the absorption of large quantities of hydrogen by metals. Embrittlement of the metals may be due to hydride formation, to strain imposed by occlusion of molecular hydrogen in submicroscopic rifts and to deposition of hydrated ions—phenomena that are already recognized by electroplaters.

Less recognized, perhaps, are the functions of hydrogen occluded within the steel. The extremely low solubility of steel for hydrogen at ordinary temperature, combined with the extraordinary ability of this metal to absorb huge quantities of the gas when presented atomically at the surface during pickling and cathodic electrolysis, causes important effusion of this gas from the steel when the atomic layer is removed by the presence of an applied coating or by cessation of the hydrogen-producing process. Descaling by cathodic electrolysis is largely accomplished by the exploding action of this gas which diffuses into the steel at exposed areas and reappears at areas unexposed to the atomic gas.

When the effusion occurs beneath a coating of any material, including metals, whose permeability is unsuited to the quantity of the effusion, the coating may be (1) lifted from the steel or ruptured, or both, by the pressure of the accumulating gas, or (2) blistered, depending upon the qualities of the coating.

If the plated ware is heated, the effusion of hydrogen is accelerated and the coating is weakened, so that occurrence of the above defects is favored.

Effusion of the gas from the steel base during electroplating leads to the formation of gas pits in the coating.

Cathodic cleaning in either acid or alkaline solutions provides large quantities of hydrogen for absorption.

One of the interesting highlights brought out by the discussion was the fact that sheared edges of metal give more trouble with occluded hydrogen than rolled surfaces. The sheared faces exposing pure metal allow the effusion of gases more freely to exert pressure on the electroplate, resulting in blisters, peeling, etc. The rolled faces, having a laminated structure of both pure and impure metal, hold the absorbed gases better, permitting a more adherent plate. These differences are more clearly marked at high temperatures.

R. O. Hull, E. I. duPont de Nemours & Co., read a paper on "Magnesium as a Control Agent for Zinc Anodes."

[1] Patents pending.

[2] Mo. Rev. Amer. Electroplaters' Soc., 24, 822 (1937).

[3] Mo. Rev. Amer. Electroplaters' Soc., 25, 340 (1938).

One of the principal problems in the operation of any cyanide zinc plating bath is the maintenance of solution composition with respect to zinc metal. This is particularly true of the bright zinc plating baths that are now widely used, since these invariably require close control of all components.

Control of zinc metal in cyanide solutions is relatively difficult because of the fact that zinc anodes are dissolved chemically by the highly alkaline plating baths as well as electrochemically, which with a variable cathode efficiency usually results in a rapid, sometimes almost uncontrollable rise in zinc concentration.

The most common procedure for controlling zinc metal content of bright zinc baths is to use from 25 to 50 per cent inert, insoluble steel sheet with the zinc anodes. Although some measure of control is possible by this means, a serious complication arises from electrical contact of the zinc and iron in the alkaline solution, giving an electrolytic couple and resulting in as much as a ten-fold increase in the normal rate of solution or corrosion of the zinc. Under such conditions, the zinc concentration falls when the solution is worked and rises when the solution is idle, sometimes changing as rapidly as one ounce per gallon per day; hence this means of control is generally unsatisfactory.

The principle utilized in the present method for controlling zinc anode efficiently is believed to be unique in electroplating and consists of adding a small amount of magnesium or calcium as a secondary metal during the process of manufacture of zinc anodes. Both of the secondary metals are highly reactive and form compounds of low solubility in cyanide solutions.[1] In the plating bath the secondary metal dissolves and precipitates as an insoluble compound, presumably hydroxide or carbonate, forming a thin gelatinous coating over the anodes.

This coating exercises a two-fold effect on anode behavior. First, it reduces the rate of anode solution, or anode current efficiency, by an amount proportional to the content of secondary metal in the anode, since this factor controls the thickness of film built up on the anode. However, experience indicates that the film apparently assumes a definite maximum thickness, depending upon the secondary metal content, following which the anode efficiency remains constant.

The second effect of the coating of insoluble magnesium or calcium compound formed continuously is that it unites mechanically with loose sludge from the anodes and carries it to the bottom of the plating tank where it obviously cannot interfere with the deposits. Hence, baths using anodes containing magnesium or calcium are characterized by relative freedom from objectionable anode sludge floating about in the solution.

The amount of magnesium normally added to high purity zinc is 0.18 per cent, which reduces the anode efficiency from 100 per cent to about 84 per cent, whereas 0.11 per cent magnesium is sufficient for zinc containing 0.1 per cent of lead.

FREDERICK FULFORTH, new president of the American Electroplaters' Society. Since 1930 in charge of plating and polishing departments of Proctor Electric Co., a division of Proctor & Schwartz Co.

For barrel anodes, the magnesium addition is about 0.05 per cent which, experience has shown, is quite satisfactory for maintaining the zinc content, provided the anodes are not in contact with steel and are completely insulated from the sides of the metal tank.

In bright zinc plating it is not only desirable but quite essential to maintain the zinc metal within narrow concentration limits, if bright deposits over the usual current density ranges are to be obtained at reasonably high cathode efficiency. Magnesium-zinc alloy anodes for accomplishing this have been used extensively in commercial baths and have proved almost indispensable in the reasonable exercise of solution control for their operation and maintenance.

A paper by Dr. William Blum and W. A. Olson, of the National Bureau of Standards, Washington, entitled "Notes on the Spot Test for Thickness of Chromium Coatings" described the precautions necessary in the operation of this type of test for obtaining comparable results.

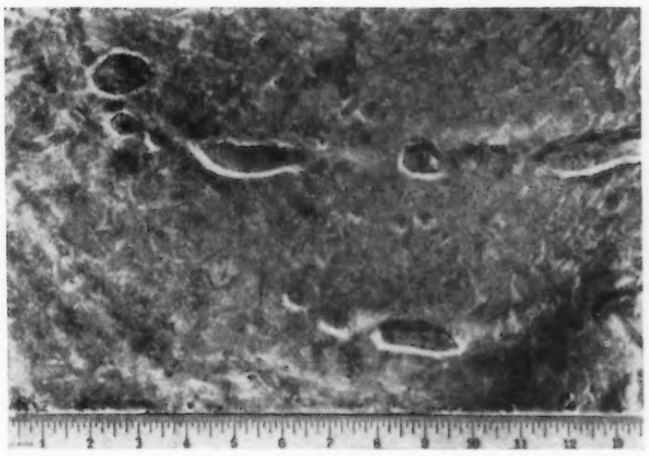
Several years ago a "spot test" for the thickness of chromium was developed and has come into extensive use, especially in the automobile industry. This test depends upon the measurement of the time required for one drop of concentrated hydrochloric acid to dissolve the chromium coating. Apparently the test was at first simply conducted at "room temperature," but it was soon realized that fairly close control of, or correction for, the temperature was necessary to insure consistent results.

At the American Electroplaters' Convention in 1937, data were presented by P. W. C. Strausser[2] and by W. L. Pinner and L. B. Sperry[3] upon the effect of temperature upon the spot test. Because the results in these two papers were differently expressed, no attempt was apparently then made to correlate the two investigations. Strausser's data were used for the curve in the Joint Specification (A.S.T.M. Designation A219-39T) adopted in 1939 by the American Electroplaters' Society and the American Society for Testing Materials.

Recently it was informally reported by E. M. Baker and W. L. Pinner that results obtained in practice did not closely conform to either of the above sets of data. In the investigation reported in this paper, the causes of certain discrepancies were revealed, and the importance of controlling not only the temperature but also the concentration of hydrochloric acid was established.

These observations have been incorporated in a description of the spot test which has been recommended as a substitute for the procedure now included in the tentative methods of test for local thickness of electrodeposited coatings on steel, as adopted in 1939 by the American Electroplaters' Society and the American Society for Testing Materials.

The "Disposal of Plating Room Wastes" was described by T. J. Fadgen, of the Ternstedt-Trenton Division, General Motors Corp. The trade waste from all areas of the plant is piped directly to a treatment unit located about a quarter of a mile from



TYPICAL blisters in galvanized steel sheet caused by hydrogen absorbed principally during pickling.

the factory proper and thence to the city treatment plant. The water wastes entering this unit consist of the rinse waters from all nickel, copper and chrome plating units, waters from factory air purifying systems, cooling units on the die casting machines and condensing coils on the degreasers. Attention must be called to the fact that all work emerging from the plating tanks proper is first submerged in a recovery tank prior to being rinsed. This is done for two reasons: (1) to recover as much of the plating materials as possible and (2) to dilute the waste discharged into the treatment plant.

All the exhaust systems from the metal polishing lathes are connected to centrimerge units where the air is washed to free it from dust and lint. The water from these units is discharged to the trade waste tanks, but before entering these tanks it is passed through screen hoppers where the solids are removed. This material, when cleaned from the hoppers, is burned. A special building is designed to handle any discarded cyanide copper plating solutions.

The cyanide disposal house is capable of handling 6000 gallons of solution. The interior is completely lead lined and all normal entrances and walls are completely air tight. From the peaked roof of the building projects a 100 ft. stack to discharge the hydrocyanic gas generated.

The method for treatment consists basically of treating the copper cyanide solution with sulphuric acid until a pH of approximately 4 is reached, and discharging the evolved gas into the atmosphere while the precipitated copper cyanide is collected in the bottom of the tank.

C. A. Kotterman and W. Binai of P. R. Mallory & Co., Indianapolis, presented a paper on Magnesium Copper Sulphide Rectoplaters as a Source of Direct Current Power for Electroplating.

The mechanism of the magnesium copper sulphide rectifier was described and fundamental transformer-rectifier circuits were evaluated in terms of useful power supplies for electroplating. Air blast cooling of transformers and rectifiers was discussed showing how economical and compact power supplies results. Two different types of plating power supplies were described, one being the custom built and the other a simplified standardized "power pack" having two or three voltage outputs with a capacity of 500 or 750 amp. per bridge.

The advantages of these new developments in plating power supplies over existing equipment were briefly summarized:

(1) They have a weight and size ratio of one-fourth to one-half of that of the equivalent capacity of rotating types of power supplies.

(2) They require no mounting base and are readily moved from one location to another, thus providing the utmost in flexibility of plant operation.

(3) The Rectoplaters are self-contained, requiring no auxiliary control equipment.

(4) Their starting current is approximately equal to their running current; therefore, no additional starting equipment is required.

(5) Being a static device, no heavy rotating masses and commutating devices are employed. The fractional horsepower ventilating motors are of the grease shielded ball-bearing type requiring but semi-annual lubrication.

(6) Maintenance costs are reduced to a minimum.

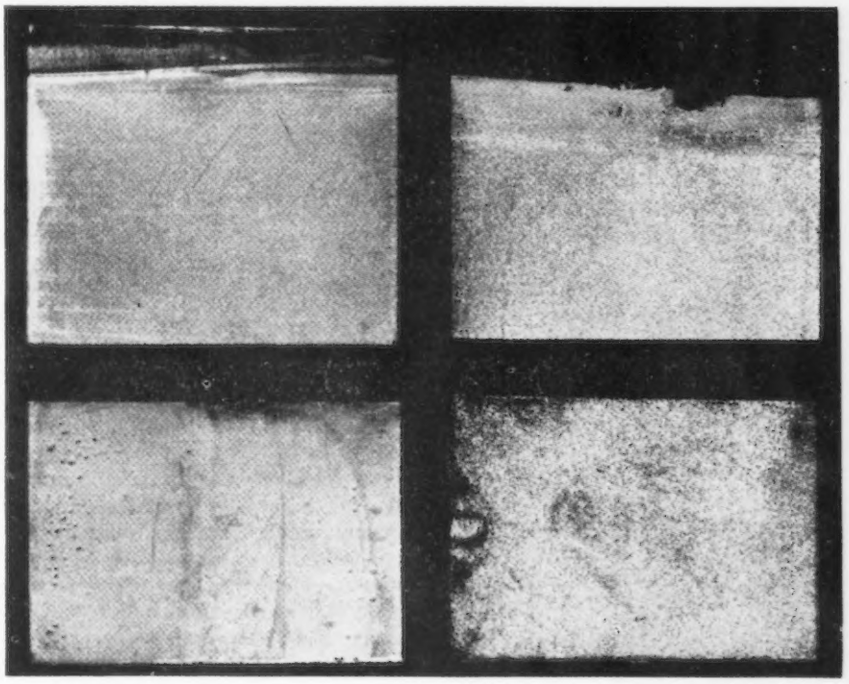
(7) They operate instantaneously when turned on, eliminating any warming-up period. Production starts immediately.

(8) Their efficiency remains practically constant from 25 per cent to 125 per cent load.

(9) Their excellent regulation provides a d.c. voltage output of but 15 per cent less at full load than at no load.

(10) Being small in size and made in capacities large enough for many of the more common barrel and tank plating processes, they may be installed at or adjacent to the plating equipment.

(*To be continued next week.*)



HYDROGEN blisters in cadmium coating on steel. (Upper) After plating. (Lower) Specimens heated to 210 deg. C. (410 deg. F.). (Left) Specimen cleaned cathodically. (Right) Specimen cleaned anodically.

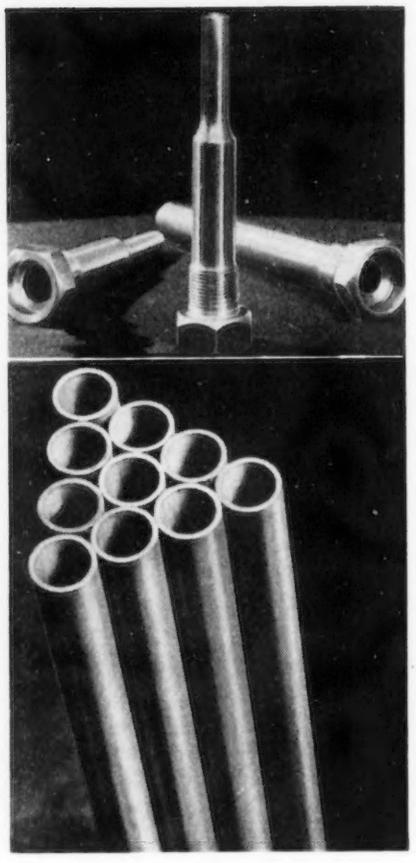
Illium Available in New Forms

ILLIUM, a non-magnetic, corrosion resisting, complex nickel-chromium base alloy, with a more than 20-year record of service to industries using or making industrial corrosives, recently announced new available forms including rolled strip, welded tube, rolled rod stock and a limited amount of drawn wire. Illium had been practically taken off the market for a few years while the producers worked out improvements in the material to widen its fabrication possibilities.

Now the latest development has been the fabrication of high grade thermocouple protection tubes from Illium tubing. (See lower view in accompanying photo.) One of the largest steel companies is using such tubes in a variety of sizes ranging from 5 to 7 ft. in length. These tubes average 1 in. o.d. by 0.083 in. to 0.062 in. wall. The service is in a highly oxidizing electrolyte solution of 25 per cent sulphuric acid at 150 deg. F. with admixtures of other acids and salts.

With the introduction of Illium strip and rolled stock the field of its usefulness has been greatly widened. Illium was formerly available in cast form only. Now, in addition to rough cast, rough machined or finished pattern castings, centrifugal cast tube and cast bar stock, Illium is furnished in rolled strip in gages from 8 to 34; butt-welded tube made from strip stock; rolled rod for use in screw machines, as tie rods, shafting or pins. Forerunners of the new Illium welded thermocouple tubes were the machined and polished Illium cast thermometer protection tubes (upper view in accompanying photo) widely used today by instrument manufacturers in various lines to combat severe service conditions.

Present-day Illium, its properties, characteristics and its range of serviceable applications, is presented in Bulletin No. 103-A, a copy of which may be had upon request from the manufacturers, the Burgess-Parr Co., Freeport, Ill.



On the Tendency of Welds to Crack

THE phenomenon of the cracking of mild steel welds during cooling has been investigated by E. Helin and S. Svantesson, of the British Institute of Welding. (Abstract by British Iron and Steel Institute.)

According to the authors the following factors appears to be of major importance: (1) Inclusions of slag and unfused particles from the electrode coating; and (2) segregating constituents from the weld metal or parent metal. The unavoidable stresses from cooling shrinkage as well as the development of internal gas pressures may be considered primary causes. Such gas pressures may be due to occluded, gassing constituents from the coating or to the development of carbon oxides in the mother-liquor due to excessive concentrations of oxygen, or carbon, or both. Sulphur seems to exert an especially pernicious influence. Carbon and phosphorus *per se* appear to have little effect.

In regard to electrodes, many different types meeting various technical demands may be found on the market. While the final development of electrodes has by no means been attained, nevertheless, at the present time there exists hardly any sound commercial structural steel that may not safely be welded. From the viewpoint of general welding development, the major task of the electrode industry appears to be the development of electrodes yielding improved welding economy, together with a constantly tightened control of quality.

The investigation made by the authors indicated that in regard to the common and economic alloying elements carbon, manganese and silicon, these may be made use of to any extent in the promotion of stronger and better qualities so long as the steel is weldable, *i.e.*, not hardenable to a dangerous extent during normal welding procedure in the cold condition. Moreover, it may be inferred that other alloying elements contributing to the attainment of stronger and better structural steels may well be made use of. In regard to phosphorus, as high a content as 0.070 per cent appears to be permissible. With the majority of electrode types sulphur must be considered a potential source of trouble, yet electrode types are to be found which successfully weld highly sulphurous steel plate.

In regard to the standardization of structural steels for welding purposes, it is of primary importance that the steel should not be hardenable. From the viewpoints of cracking and general welding utility and economy, the following divisions may be considered for chemical classification purposes: (1) Rimmed steels containing carbon 0.24 per cent maximum and a trace of silicon; (2) killed steels containing carbon 0.19 per cent maximum and silicon 0.20 per cent maximum; and (3) alloyed structural steels in which the criterion of chemical composition would be that the limit of hardenability is not exceeded. Such a chemical classification complementing the mechanical one generally adopted would result in an increase in efficiency throughout the welding industry.

What's New in Plant Service Devices

ITEMS of interest to the plant engineer and the maintenance man are presented in this report, compiled from recent announcements of the suppliers and manufacturers.

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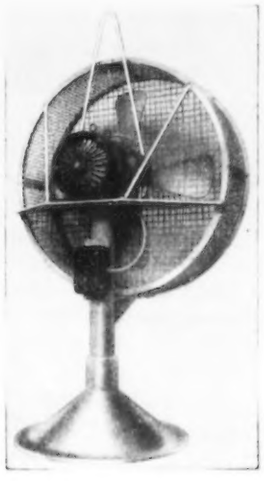
By FRANK J. OLIVER
Associate Editor, The Iron Age

o o o

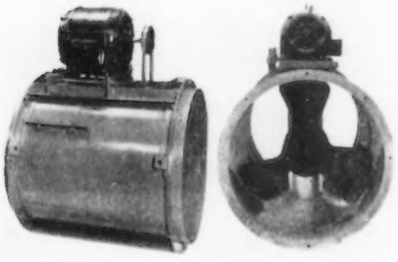
HEAVY duty, portable man cooling fans in sizes from 12 to 36 in. diameter are announced by the *Truflo Fan Co.*, 531 Main Street, Harmony, Pa. The illustration shows the 36 in. size. Center of the four blade, cast aluminum fan wheel is 48 in. from the floor, and cast



iron base is 32 in. in diameter. Fan is driven by a 3-hp. motor at 1150 r.p.m. Total weight of the unit is 356 lb., but it is provided with a ¾-in. round looped bar for handling with overhead crane. These fans are constructed for hard usage and are so designed that the flow of air does not necessarily play directly on worker.

Straight Line Exhauster

FOR handling air containing steam, dirt, fumes, paint, water spray, grease or vapors, a new straight line exhauster has been developed by the



L. J. Wing Mfg. Co., 154 West 14th Street, New York, as a companion to its elbow type exhauster. It is available in horizontal design as illustrated or vertical. Exhauster is equipped with Wing-Scruplex propeller fan, said to deliver large air volumes against duct or wind resistance. Motor is located outside the duct and drives by V-belt, allowing a wide range of fan speeds to be selected to fit any condition. Location of the motor outside the air duct keeps it clean and cool and reduces fire hazards.

Ventilating Fan

SLOW rotative and peripheral speeds with less vibration and reduced power consumption; quieter operation resulting from streamline inlets shaped to form whirl-free passages; high efficiency over a large operating range and less maintenance are said to characterize the Design 7 Silentvane centrifugal fans recently added to the line of the *B. F. Sturtevant Co.*, Hyde Park, Boston. Mechanical efficiencies in excess of 70 per cent are obtained over 53 per cent of the performance range. The units have gradually increasing horsepower and volume characteristics until the point of maximum efficiency is reached, then decreasing horsepower for larger volumes. Straight fan blades pitched at an angle of 45 deg. at delivery are used to give freedom from dust loading. This fan is available in all standard discharges, single and double inlet, with wheel diameters ranging from 14⅝ to 87 in.

Two-Stage Pumps

SUITED to all classes of general pumping service where the liquid is of low viscosity and free from foreign matter is a new line of two-stage, split casing centrifugal pumps with capacities up to 550 gal. per min. at heads ranging up to 600 ft. Developed by *Fairbanks, Morse & Co.*, Chicago, the line incorporates numerous features that contribute to operating efficiency and long life. One piece impellers are made of cast iron, hard bronze or other alloy and are mounted back to back to given hydraulic balance. Removable wearing rings with streamlined water guiding surfaces are provided on both casing and impeller. Alloy steel shaft is protected by centrifugally cast bronze sleeves and is carried in ball bearings. These pumps are supplied as basic units and also as base mounted units direct connected to electric motors or steam turbines.

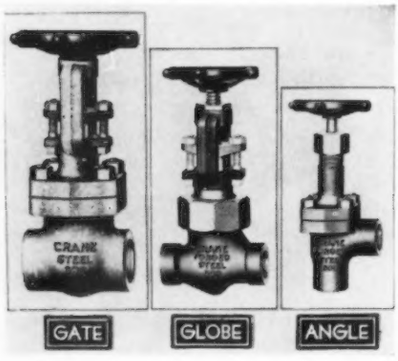
600 Lb. Steel Valve

MAIN feature of the Hancock Duravalve Junior, rated at 950 deg. F. at 600 lb. steam pressure, is the seat, which is Stellite welded integral with the body. This integral seat construction is said to eliminate any chance of leakage between seat ring and body. The valve disk is also

heavily Stellited to resist wire drawing and wear. The valve has a body and bonnet of carbon molybdenum steel. This valve is available from the *Hancock Valve Division* of *Manning, Maxwell & Moore, Inc.*, Bridgeport, Conn., in sizes from ¼ to 1 in. in the globe type, with either screwed or socket welding ends.

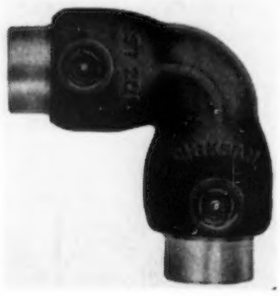
Small Steel Valves

A LINE of small steel valves for steam and oil service in sizes from ¼ to 2 in., including gates, globes, angles and checks, has been announced by the *Crane Co.*, Chicago. Gate valves are made of cast steel with O. S. & Y. construction, having union bonnet type in screwed ends in sizes ¼ to ¾ in. and bolted bonnet with screwed, socket weld and flanged ends in sizes ½ to 2 in. Globe and angle valves are made of forged steel in two types—inside screw and O. S. & Y. construction. Check valves also are made in two types. The horizontal pattern is forged steel with union cap and screwed ends in the smaller sizes, and with bolted cap and screwed, socket weld and flanged ends in the larger sizes. The vertical ball pattern is cast steel with bolted joint and screwed ends in sizes ½ to 2 in. The cast steel valves are made from steel melted by high frequency induction methods with exacting control of composition. All these valves are for pressures up to 600 lb. steam.



High Temperature Swing Joint

CARE has been taken to provide for unobstructed flow through all the bends of the new Chiksan high temperature swing joint designed for operation at pressures up to 500 lb. All pressure or load at the joints is transmitted through double rows of hardened steel balls in flame hardened races. The packing chamber is chromium plated and polished. Packing is a combination of asbestos and brass rings held in place by an alloy wire spring. This joint is made by the



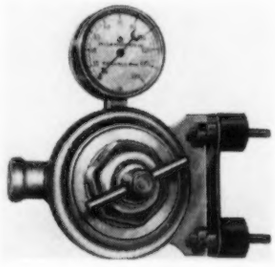
Chiksan Tool Co., Brea, Cal., in six styles for full rotation in one, two or three planes. Style No. 60 is illustrated.

All Purpose Fan

AN all purpose ventilating fan that provides any normal required amount of air changes per hr. without objectionable noises is announced by the *Autovent Fan & Blower Co.*, Chicago. Features of this Allvent fan include V-belt drive which makes possible slower and quieter operation and greater efficiency with 1750-r.p.m. stock motors than heretofore obtained with costlier, low speed motors. The newly designed three blade fan wheel is said to supply or exhaust unusually large volumes of air at low speeds. Motor sizes range from 1/6 to 1 hp.

Combination Air Regulator

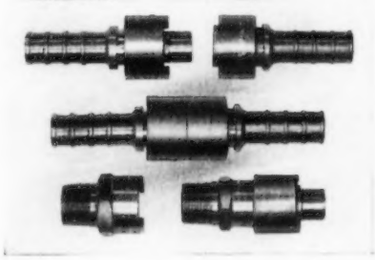
A COMBINATION pressure gage and reducing regulator valve for receiving a varying or high air pressure on one side and automatically delivering a constant reduced pressure at the outlet side, has been placed on the market by the *Dayton Rogers Mfg. Co.*, Minneapolis. A safety relief valve and replaceable cartridge type



filter on the inlet side are incorporated in the design. Three extra regulator seats are furnished in a compartment on the adjusting screw. Each unit is provided with a mounting bracket having vibration dampers to relieve machine shock.

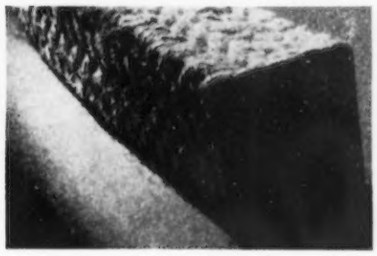
Pressure Hose Couplings

THE *Pittsburgh Brass Mfg. Co.*, 3225 Penn Ave., Pittsburgh, has developed a line of cast bronze hose couplings for joining similar or dissimilar sizes of rubber hose on air, water, steam and gas lines operating up to 200 lb. pressure per sq. in. In addition to quick opening and closing features, these Fuline hose couplings employ a positive locking device. This safety feature is particularly valuable when coupling is employed on air compressors and for steam connections in boiler rooms, etc. Illustration shows male and female Fuline hose couplings ready for connecting and also connected, as well as male and female pipe ends. Standard sizes are available for ⅜, ½, and ¾-in. hose.



Lattice Braid Packing

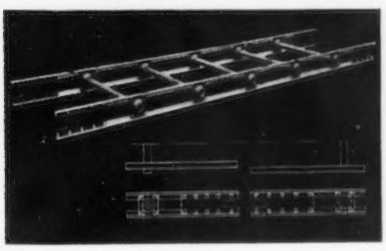
AN entirely new form of packing construction is employed in the new Lattice-Braid packing developed by the *Garlock Packing Co.*, Palmyra, N. Y. Every braiding strand passes diagonally through the body of the packing at an angle of about 45 deg., thus making a completely unified structure. Hence no matter how badly the packing becomes worn it will not dis-



integrate into a series of strands or loose parts. The braided structure also imparts to the packing a flexibility not obtainable in packings of standard square or round construction and packings of large size can be formed around rods of small diameter without distortion. Controlled porosity is obtained, which imparts a semi-automatic action. In service, the bottom ring, which is under lightest mechanical pressure in the stuffing box is the most porous and allows some pressure filtration through the packing in decreasing amounts as the mechanical pressure is increased and the porosity reduced as the gland is approached. Lattice-Braid packing is made in many types and sizes.

Aluminum Sectional Ladder

AN easily portable sectional telescoping ladder, designed for general maintenance work around plants, has been developed by the *Aluminum Ladder Co.*, 130 Adams Street, Tarentum, Pa. The ladder illustrated is made in five sections, each 6 ft. long. Total working length is 26 ft. and the weight is only 48 lb. Either steel spikes or rubber boots can be fitted over the bottom ends. All sections are interchangeable and may be used in any combination.



Liquid Conditioner

THE Gale liquid conditioner, originally described in the Nov. 23 issue on p. 55, is now available in nine standard sizes, with capacities ranging from 15 to 1500 gal. per min. of light liquids to be separated from mill water such as lubricants, fuel oils or other separable liquids. The construction of the device, which has no moving parts, is such that the liquid mixture to be treated is allowed to flow beneath a quiescent body of fluid, whereby the continual submergence and a series of baffles and corrugations causes breaking up of the mixture so that the lighter liquids, separated oils and other substances automatically rise to the surface where they may be drawn off continuously. The unit is made by the *Gale Oil Separator Co., Inc.*, Chrysler Building, New York.

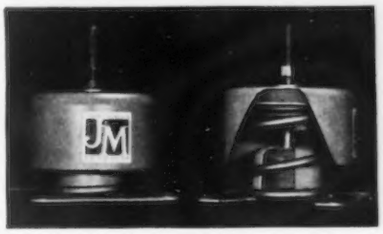
Oil Flusher

THE Port-O-Flush portable oil flusher and dispenser, illustrated, is offered by *J. A. Honegger*, 223 Spruce Street, Bloomfield, N. J., for

use in flushing out and oiling machinery of various kinds. Oil is introduced into bearings at 60 to 100 lb. per sq. in. pressure by means of air or gas pressure. The instrument will handle oils of all viscosities from kerosene up to 600 W. Container holds 1 qt. The flushing action will carry any dirt or metallic particles out of the bearings.

Vibration Isolator

THE J-M controlled spring isolator was developed by *Johns-Manville* for use on the bases of motors, generators, pumps, ventilating fans and similar equipment where vibration and excessive motion create noise and tend to wear out machine parts and damage connections. The working parts consist of a coil spring and a rubber pad, which support the equipment and isolate vibration, and an adjustable rubber snubber inside the base that controls excessive motion. Tests indicate the device to be particularly efficient for low frequency vibrations resulting from slow speeds or reciprocating motion. The load pad overcomes high frequency vibrations. The isolator is made in two sizes: Light duty for loads from 60 to 190 lb. per unit; and



heavy duty for loads from 250 to 720 lb. per unit. The units may be arranged in clusters.

Marking Plates

THE *Mosebach Electric & Supply Co.*, 1166 Arlington Avenue, Pittsburgh, has brought out a line of cast, acid resisting bronze numbering plates for marking plants, gates, tanks, stations, etc. The plates are available in any size up to 3 by 2 ft. and can be supplied in any style or combination of letters and figures, which are raised from the surface of the plate. Fitted with a shank and clevis for hanging, the plates can also be drilled for bolting onto flat surfaces.

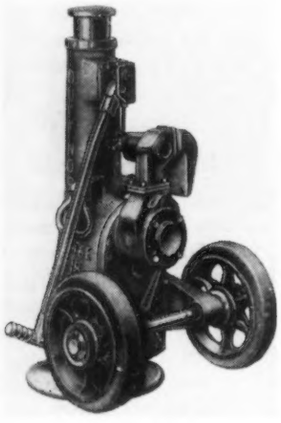
Fire Fighting Unit

CLAMPED to the wall as a fixed system installation, yet readily portable is a new piece of industrial fire fighting equipment developed by the *C-O-Two Fire Equipment Co.*, 10 Empire Street, Newark, N. J. It consists of a 50-lb. cylinder of carbon dioxide, 50 ft. of reinforced rubber hose and a large discharge horn fitted with a quick-opening valve for governing discharge of gas from the cylinder. It can be used to extinguish fires with-

in the hose range or can be carried to a remote location. The carbon dioxide gas is a non-conductor of electricity and is non-damaging to machinery or finishes. It snuffs out fire instantly.

20-Ton Air Jack

ANNOUNCEMENT of a new 20-ton rotary air motor jack is made by the *Duff-Norton Mfg. Co.*, Pittsburgh. Although it was especially designed for railroad service, it is adaptable to general industrial use. It is mounted on rubber tired, roller bearing wheels. The accurately timed lift permits one man to operate two jacks through a Y-valve connection. Limit of raise is 18 in. and when the lifting



standard reaches the top or bottom of the stroke, the motor is automatically cut off.

Repairs Concrete Floors

AN instantly drying, premixed repairing material for holes in concrete floors has been announced by the *Rock-Tred Co., Inc.*, 629 W. Washington Boulevard, Chicago. The material is of soft, lumpy consistency that dries and hardens upon being tramped into place. Floors can be repaired with this so-called Speed-Patch in 3 min. or less, it is claimed.

Floor Resurfacer

IMPROVEMENTS have been made in the composition of Ruggedwear resurfacer for cement floors, made by the *Flexrock Co.*, 23rd and Manning Streets, Philadelphia. In place of ordinary asbestos fiber, a fibrous rock known as Chrysotile has been substituted. These fibers are resistant to all ordinary acids, have twice the strength of asbestos fibres, are waterproof and will not disintegrate, it is claimed. With its Montmorillonite, semi-metallic base, mineral asbestos, cellulose for toughness and in addition Chrysotile for additional toughness and strength, Ruggedwear is said to have superior qualities as a floor repair material, particularly in giving a tougher feather edge.

Floor Sealer

FOR treating unfinished wood floors, the *American Asphalt Paint Co.*, 43 E. Ohio Street, Chicago, is offering its Valdura floor sealer which seals the grain and achieves a waxed and polished surface. Only one coat is needed and 1 gal. will cover about 800 sq. ft. of surface. A minimum of 3 to 4 hr. drying time is needed. It protects the floor against dirt, water, grease and wear.

Abrasive Coating

AN abrasive coating material for application to wood, concrete or metal steps or inclines is known as Armor-Plate No. 419, offered by *Unite Laboratories, Inc.*, 16801 Euclid Avenue, Cleveland. Made by mixing refractory flakes of micaceous metal ore in a varnish vehicle, the paint forms a surface that resists abrasion and is non-skid whether wet or dry or oily. It can be used for coating metal floor plates in industrial plants, provided such plates have no sharp pointed risers that present a small contact area to the sole of the shoe. It resists inorganic acids and can be used either indoors or out, the varnish vehicle acting as a rust inhibitor.

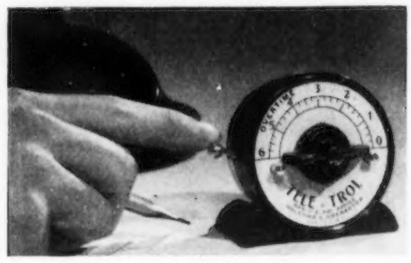
United Laboratories also make a cement floor repair material known as Plastic Rock, combining crushed and graded volcanic rock, fibrated asphalt paste and a tempering or setting powder. It can be trowled out to a feather edge on a patch job or spread out evenly over an old floor. When dry, a Plastic Rock floor is said to withstand 10-ton loads on steel wheels.

Non-Slip Floor Paint

SAFE-T-STEP is the name of a new rubber base paint combined with an abrasive to take the skid out of concrete or wood floors. The material, which is made by *Truscon Laboratories, Inc.*, Detroit, can be applied over painted floors provided they are free from grease, oil and dirt. It dries within 4 to 5 hr. The rubber base gives tough, wear resisting properties and the abrasive makes the surface non-slippery even when it is wetted or oil splashed. The paint comes in four colors.

Telephone Timer

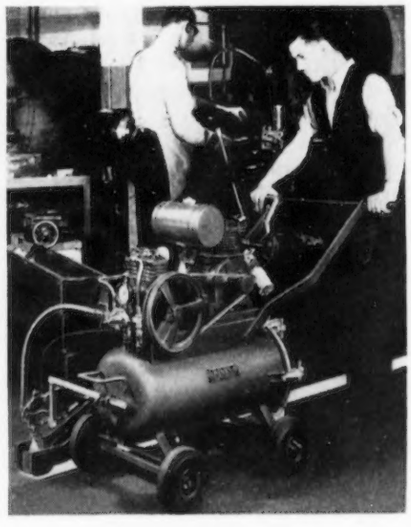
NEWEST protection against expensive overtime on long distance telephone and teletype calls is the Tele-Trol. As soon as the call is connected, a touch of the lever starts the



device. A warning bell rings automatically, 15 sec. before the 3 min. (long distance) period is ended, thus allowing the user ample time to close his conversation before incurring overtime costs. The Tele-Trol was developed by *Holcomb & Swenarton*, 92 Liberty Street, New York.

Spray Line Marker

A COMPLETELY self-contained portable spray unit for the marking of traffic lines in plants has been developed by the *Binks Mfg. Co.*, 3114 Carroll Avenue, Chicago. This No. 240 marker will lay down a stripe 2 to 6 in. wide at the rate of 1 to 4 miles per hr., depending upon the condition of the floor. It is equipped with a ¾-hp. gasoline engine driving the compressor and four pneumatic tires. The container holds 12 gal. of material which is supplied the spray gun.



REVERE IS READY WITH THE 3 M's for "M-DAY"

In a time of common sense and calm, years ago, the War Department of the United States foresaw that there might arise a grave national emergency when the power of America must be swiftly and efficiently marshalled for the protection of the land, its peoples and its customs. Calmly, a plan for marshalling America's might was worked out in detail. It is called the "M-Day" plan. In this plan, every man has a role — every industry a duty.

In common with every man and woman to whom America is dear — in common with the whole of American industry — Revere Copper and Brass Incorporated profoundly hopes there will be no "M-Day" — but is ready with the three essentials for its success.

...the METALS

Since its founding by Paul Revere in 1801, Revere Copper and Brass Incorporated has amassed industry's most complete file of vital data on copper and its hundreds of alloys. In this file are thousands on thousands of practical facts—proved by exhaustive research in both laboratory and field. From this vast storehouse of metal lore, government and industry are able to know more swiftly and more surely which metal is most efficient and most economical for the purpose.

...the MEN

Typical of the spirit of 8,000 Revere men are these skilled craftsmen. The one at the right, has been a Revere man all his working life. Long ago, Revere recognized the importance of *trained man-power* to national security. Its organization includes a Technical Advisory Service of experienced engineers to help analyze individual requirements of a problem—a Methods Staff, to insure rigid adherence to specifications—and, above all, a loyal corps of skilled workers to get the work done right and done quickly.

In publishing this advertisement in the New York Times, June 11, 1940, Revere feels it was speaking for the men as well as the management of all American industry.

...the MACHINES

In the past few years, Revere has invested millions of dollars in modernizing its many mills—even inventing its own machines to abolish "bottle-necks" and produce better products. This expansion enables material to flow through in minimum time with maximum control of quality. Heavy muscular labor has been largely eliminated, with a resulting increase in safety as well as capacity.

FOUNDED BY PAUL REVERE
1801

REVERE COPPER AND BRASS INCORPORATED

Executive Offices: 230 Park Avenue, New York • Mills: Baltimore, Md. • Taunton, Mass. • New Bedford, Mass. • Rome, N. Y. • Detroit, Mich. • Chicago, Ill. • Sales offices in principal cities

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Ford's emphasis on planes for "defense only" a factor in program's early stages . . . First steps in tooling for large scale production were taken 16 months ago . . . Problems of engines to be tackled first

DETROIT—As generally anticipated here and predicted by high Ford officials several weeks ago, the Ford airplane deal with the Government reached its definite and official stages when announcement of the project was made from Washington. Behind the events now transpiring, however, is an interesting and, as yet, not-quite-clear history of Ford's preliminary and generally unpublicized moves along the course which he is now traveling so publicly.

Ford's actual participation in a program to tool up for production of a large airplane engine had its roots in March, 1939, nearly 16 months ago. At that time it was an open secret that important Ford executives, including Oscar Hovey and Walter Wagner, prominent at Lincoln; Howard Kellogg, machinery buyer at the Rouge plant, and representatives of the Ford plants in France and England were together in Europe for a period of six weeks studying the high-powered engines used in French and English military planes. The story can be traced from its earliest stages in frequent mentions in THE IRON AGE.

Upon the return of this group to Detroit, the tool engineers and machinery buyers went to work on the Rolls-Royce blueprints and started rapidly a tooling program which, it was understood, would provide the Allies with these engines in quantity, manufactured in a French plant but according to American mass-production ideas.

Mid-summer saw the program halted abruptly, because Henry Ford ordered it stopped. Some see in this a Ford premonition that war would start in the fall, and Ford said then that he would not build military engines "except for defense." This is one of the not-quite-clear points: Ford appears to have been willing to help tool up one of the European nations for a defense in a threatening war, but not in an actual war program. The distinction is a fine one, and may not be entirely clear as presented here, but is believed to have been an important one to Mr. Ford.

Policy Changed After Poland Invasion

ALMOST at the time that Poland felt the effects of wave on wave of Nazi bombers, the next move was made. Here, too, the underlying motive is difficult to understand, but a basic change in policy was apparent. An organization known as Machinery Suppliers, Inc., was set up in offices in the Graham-Paige plant (half way between the Lincoln-Zephyr plant and the Rouge plant) and Ford experts played prominent roles in what followed. Lester Mix, fresh from the Ford European organization, headed Machinery Suppliers, Inc. With the reported assistance of other Ford specialists, Mr. Mix started again to tool up the Rolls-Royce Merlin engine, taking up in September where the work had been halted in June or July. About a month later, the job was switched from the Rolls-Royce to the Hispano-Suiza (French) engine. Whether there was a change in instructions from Europe, or an opinion that the French should build one of their own designs, is not known.

About two hundred machines have been shipped to France for this engine since that time last fall, along with considerable tooling. Another batch of machines is one the docks in New York now, held up by the fact that the French are suing for peace.

Parallel with the above program, about October offices were opened in the General Motors Building, Detroit, by Maurice Olley, who had served General Motors in American and European plants. It was stated that Olley had severed his G-M connection, at least temporarily, and was serving as American representative of the English Rolls-Royce company, acting principally as a procurement man.

Thus there have been two parallel programs up to the present. Now it is all one. Within the last week, Olley has moved from the G-M building to the Rouge plant, the Lincoln men have been pulled into the center of the program at that plant, and the Mix forces are correllated with them. Ford is now definitely tooling up at the Rouge for production of the Rolls-Royce engine in quantities of 20 every eight hours, 40 in a two-shift day, or 200 in a short work-week. Machine tools are to be delivered "as soon as," which means probably that priority will play a part in getting the engines into production.

Unexplained today (but with explanations likely to come unexpectedly soon) is the reported Ford interest in Allison engines and other designs for which he is said to have acquired manufacturing rights in the past few days.

May Combine Elements of Several Units

IT is known that Ford will follow conventional design lines and manufacturing technique at first in his aviation program, but maybe when changes in technique are made later (and they most certainly will, because Ford continually changes production methods) Ford plans then to combine the most satisfactory elements from several engines. This is purely conjecture—but it is impossible to ascribe any other reason for the reported interest in other designs besides the Rolls-

Royce. If this is the intention, acquisition of certain rights now will prevent interference later.

Recent changes in the General Motors organization have been intended to "facilitate an aggressive execution of such part of the national defense program as may be assigned to General Motors," according to Alfred P. Sloan, chairman, who last week transferred J. D. Mooney, vice-president, from the overseas group in New York to the main office in Detroit as executive assistant to C. E. Wilson, acting president. At the same time, Sloan moved Albert Bradley, vice-president in charge of finances, from New York to Detroit to assume additional duties as executive assistant to Wilson. Emphasizing that the changes are of an emergency character, Mr. Sloan said that the defense program will require in many cases considerable background of engineering, not only for the development of new machinery, but for the modification of existing machinery for adaptation to military purposes.

Combination rubber-and-steel armor plate, superior to and much lighter than the type now in use, has been developed for application to airplanes by United States Rubber Co. in its plant in Detroit. Experiments conducted for three years have been responsible for its development, according to F. B. Davis, Jr., president of the company. Keeping secret the formula and construction details, Davis declared that the plant was prepared to produce the armor in quantities if supplied with steel plate.

Old steampipe tunnels under the plant were converted into firing ranges for the tests which revealed that the rubber-and-steel combination is superior in bullet penetration resistance to steel armor plate of 20 per cent greater weight.

The company also has been experimenting with rubber-lined gasoline tanks which will prevent explosions even if fuel supplies in planes are hit by incendiary shells or tracer bullets fired from machine guns. There has been no announcement of this development, but tests have been conducted recently in the plant.

Regarding rubber, it is generally conceded that this country could be on a self-sufficient basis before long if required, because several processes have been announced in America for the manufacture of synthetic rubber. The Germans have had such a product for several years. It is called "Buna" rubber. This product was originally developed in Germany from coal and gas and is now being used on German military equipment.

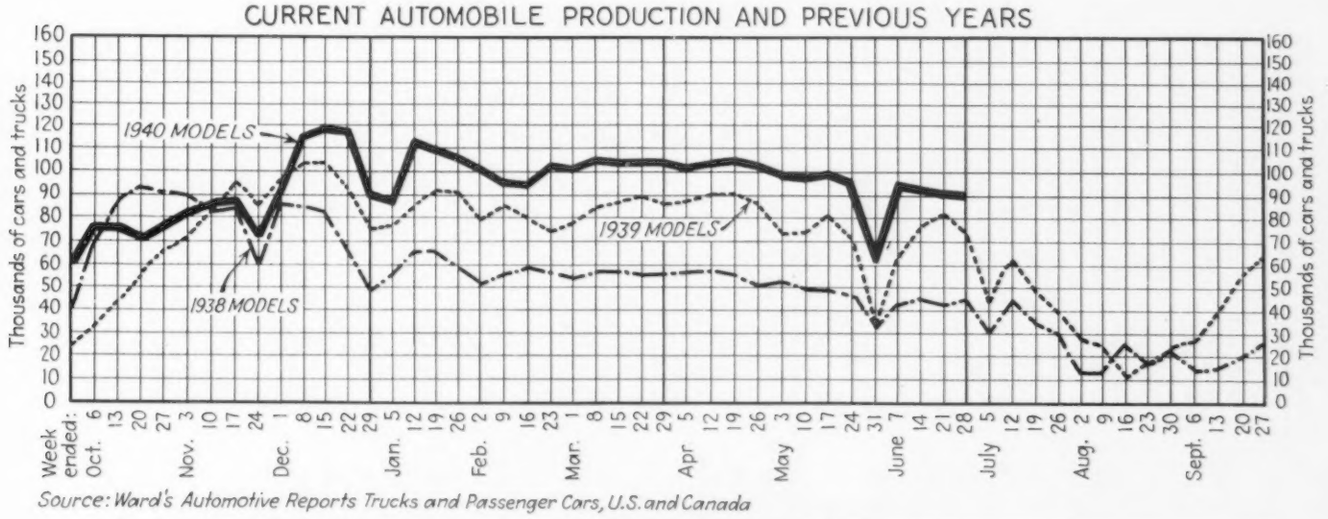
Firestone Tire & Rubber Co. has been manufacturing this product in small quantities in collaboration with Standard Oil Co. of New Jersey. Recently Standard Oil announced a new synthetic, "Butyl." There is a difference in the two products in that Buna is impervious to oil damage while Butyl is not, but each will have its use in the rubber industry just as Neoprene and natural rubber have had in the past. Butyl rubber is manufactured from petroleum.

Production of 1940 model cars at the half year mark approaches the round figure of three and three-quarter million vehicles. Nearly one million and a quarter cars and trucks have been built in this year's second quarter, just ending. That makes the year so far, since the last Auto Show, one of the most consistent on record. There have been high weeks and low weeks, production-wise, but the close of each three-month period saw approximately the same totals chalked up.

A closer study of the curves on the accompanying chart reveals little that has upset the steady pace of assembly lines, except legal holidays and the ones which the CIO created for its member-workers last Fall through a strike.

Now begins the downward slide, which this year may reach bottom before Aug. 15, which has marked the low point of recent model changeover periods. Output in the week just past was 90,060 units, compared with 93,635 in the previous week and 81,070 in the corresponding week last year, according to Ward's Automotive Reports. Assemblies this week will be in the same 90,000 range, but Friday will be the last production day on 1940 models for many of the plants in the industry.

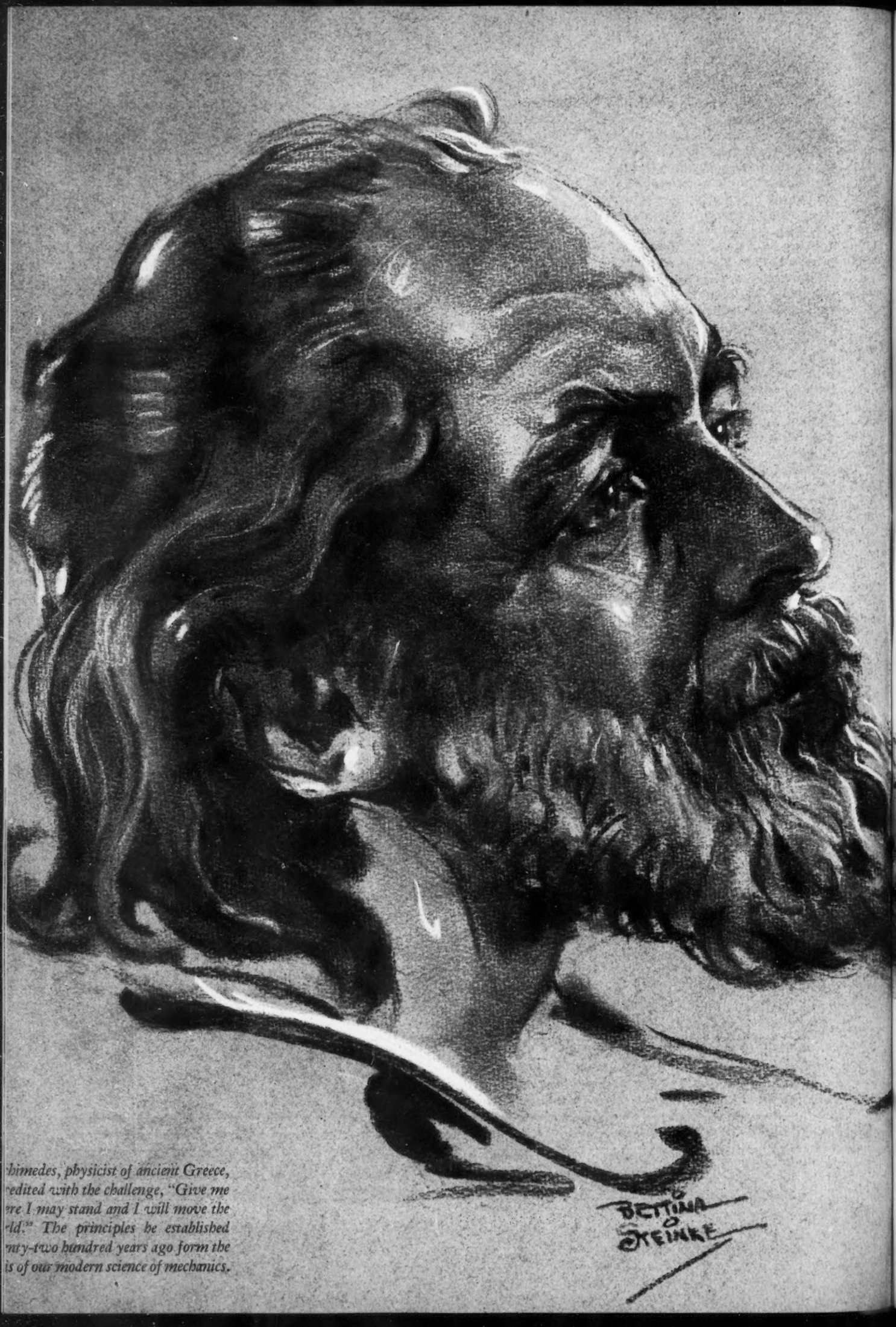
CURRENT AUTOMOBILE PRODUCTION AND PREVIOUS YEARS



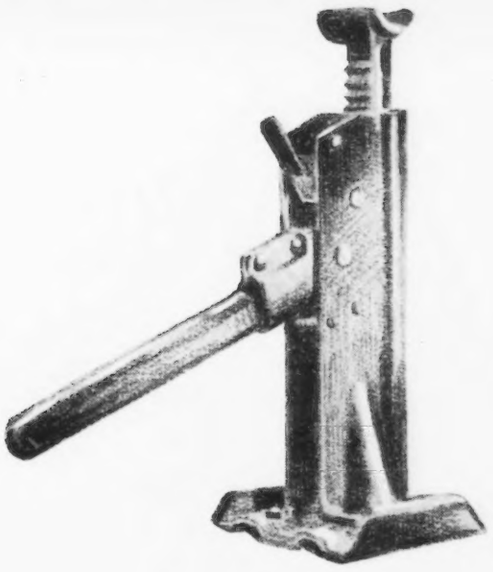
Source: Ward's Automotive Reports Trucks and Passenger Cars, U.S. and Canada

PRODUCTION COMPARISONS

	Oct., Nov. and Dec.	Jan., Feb. and March	Apr., May and June	Total to date
1938 MODELS	1,032,201	753,470	628,961	2,414,632
1939 MODELS	1,014,799	1,086,350	971,417	3,072,566
1940 MODELS	1,162,990	1,325,630	1,233,585est	3,722,205est



himedes, physicist of ancient Greece, redited with the challenge, "Give me re I may stand and I will move the rld." The principles he established nty-two hundred years ago form the is of our modern science of mechanics.



You did move the World, Archimedes!

WHAT'S THAT THING?... It's a "jack"—our simplest application of your lever and fulcrum. With it a slip of a girl can lift several tons.

Jacks are standard equipment with automobiles; in one form or another, they're used extensively in construction,—on farms, and in many industries. They're turned out by the millions—mostly stampings or forgings—formed in dies, assembled and riveted or welded together. The dies are cut in blocks of steel by means of die-sinking machines. Drills, lathes, millers, shapers, grinders—all of these may have a part in the manufacturing operation, either directly or in the *background*, building machines that build machines.

You were right, Mr. Archimedes, 'way back in the third century B.C. Your sound original work in the science of mechanics laid a broad foundation upon which man has slowly built an amazing civilization.

IN THE BACKGROUND of modern industry, you will find Pratt & Whitney machine tools, small tools and gages. Through accuracy, Pratt & Whitney keyword since 1860, production costs are lowered ... new products are developed ... new industries arise ... new jobs are created. Pratt & Whitney accuracy makes rare luxuries common. Man moves to ever-improving comfort, economy, convenience, health, safety... across the background of Pratt & Whitney accuracy.

PRATT & WHITNEY

Accuracy

Division Niles-Bement-Pond Company West Hartford, Connecticut, U.S.A.

Washington

BY L. W. MOFFETT
Washington Editor

• Steel, unlike machine tool industry, has no defense program so far . . . War, Navy appropriations will help mill schedules . . . Price control unlikely unless U.S. enters war . . . Allocation, priorities subjects for future.

WASHINGTON — Unlike the machine tool industry, which has had a $200,000,000 national defense program laid before it, the steel industry as yet does not know what demands the Government will make. Surveys are said to be under way by the National Defense Commission to determine so far as is now possible the prospective requirements. But any precise estimate can not be made until definite Army-Navy programs are worked out in detail. Now that the huge appropriations have been made both the War and Navy Departments are understood to be expediting their schedules. Once that is done, tonnages of steel can be fixed with close approximation, thus breaking down rough calculations. Obviously the question is not simply a matter of quantity. That in itself is not a serious problem for an industry of some 73,000,000-ton ingot capacity. The kind of steel needed, calling for expansion or conversion of capacity, and the avoiding of bottlenecks, require greater study.

But already headway is being made in this direction. An instance relates to the plans for a large production of armored tanks of various kinds and sizes. While the amount of steel they will call for is not yet known, progress is being made in eliminating the bottleneck regarding tank armor and axles, as well as developing additional sources for fabricating tanks.

Shift from Commercial Output Ahead

INDICATIVE of preparations being made for increasing armor tank plate capacity is the announcement by the Republic Steel Corp. of its plan to expand its productive facilities to make this grade of steel in cooperation with experienced fabricators. This rolled material has been described as being bullet proof and ranging from ¼-in. to 2-in. in thickness, as contrasted with special treatment plates, also rolled, with a thickness of 1½-in. to 3-in., or with actual armor plate, a forged product, with a thickness ranging from 3-in. to 20-in.

The steel industry manifestly will find itself called upon for increasingly large national defense tonnages and for shifting from commercial to war output. Experience gained from the first World War, together with subsequent educational orders, enlarged and improved capacity, thanks to the much criticized technological developments, has put the industry as a whole in a good condition to meet demands which are being hastily put upon it, and related industries, such as the foundry industry.

Exhaustive mobilization surveys of the War and Navy Departments are carefully indexed, and these departments, as well as the National Defense Commission, through these records are rather well acquainted with capacities, their character, location, etc., and also their ability for transition from normal to war products. Except for possible instances, there will be no lack of capacity. There is some concern, however, that if operations have to be stepped up greatly in order to expedite output there may be a lack of skilled labor.

Further survey of the country's manufacturing facilities now under way is being made, it is said, to supplement and bring up to date the mobilization records already in hand. The study is reported to be under the direction of Robert R. Nathan, chief of national income statistics, Department of Commerce. He is reported to have been selected for the study by Leon Henderson, a member of the National Defense Advisory Commission, in charge of prices.

Prices, Allocations Subjects for Future

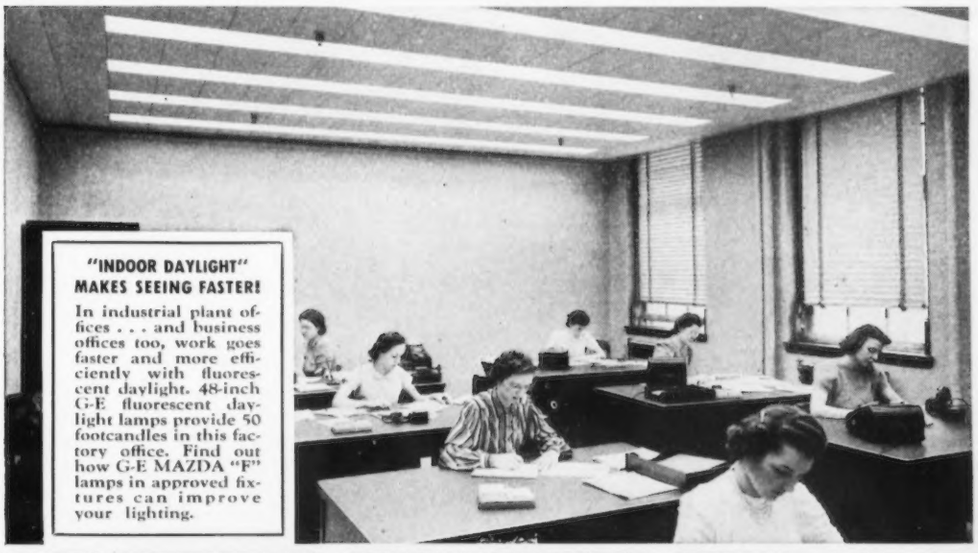
AFTER the survey is completed it is said that manufacturers will be called to Washington to confer with the commission and outline details of their productive operations and the part they can play in the national defense program. Information of this sort regarding the larger industries already is pretty well known. Hence it is believed that it will be sought with particular reference to the smaller units in industry.

What may be done later regarding prices, allocations, priorities, classifying non-essential and essential industries remains to be seen. In the absence of pressing necessity it may be that, except to a limited degree, nothing may be done. The Administration policy at present is to disturb peace-time economy as little as possible. Only casual discussion is said to have been given to any of these matters, though they could easily under the mobilization plan be quickly whipped into realities. Regardless of what power the Advisory Commission may or may not have, it or some other organization could be invested with these controls under the National Defense Act.

Respecting prices, it is believed that, barring extraordinary rises, and actual entrance of the United States into war, there will be no rigid or broad control. It may be a near prospect with regard to certain products. The fact that industry itself is warning against rises together with the fact that their trend is being policed by the Government, is taken to indicate that fixing of prices is not now under consideration. Moreover, the Government has made it clear, and industry

GENERAL ELECTRIC AGAIN

REDUCES PRICES OF MAZDA "F" FLUORESCENT LAMPS



"INDOOR DAYLIGHT" MAKES SEEING FASTER!

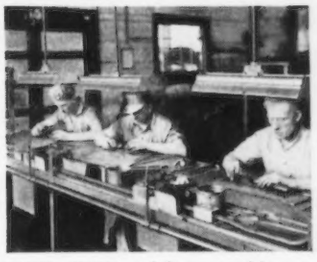
In industrial plant offices . . . and business offices too, work goes faster and more efficiently with fluorescent daylight. 48-inch G-E fluorescent daylight lamps provide 50 footcandles in this factory office. Find out how G-E MAZDA "F" lamps in approved fixtures can improve your lighting.

Lower prices will help make dollars go further in installing more light . . . higher footcandles. Fluorescent lamps and new approved fixtures now available at G-E MAZDA lamp distributors

• • •

Complete . . . ready to install!

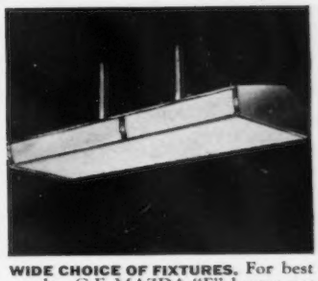
INSPECTION is made easier and eyestrain lessened by G-E Fluorescent lighting installations such as this one over inspection tables of a tin-plate plant. This better lighting has speeded production and reduced spoilage.



BENCH WORK and fine assembly generally need well diffused supplementary light to soften shadows and reduce glare. G-E MAZDA "F" lamps may provide 100 footcandles or more without causing discomfort due to heat.

FLEUR-O-LIER
"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
ETL
THIS CERTIFICATION IS CONTINGENT UPON EMPLOYMENT OF CERTIFIED

LOOK FOR THIS TAG — certifying that fixture meets specifications set up by MAZDA lamp manufacturers. Fleur-O-Liers must be equipped with auxiliaries (ballast and starters) certified by E.T.L.



WIDE CHOICE OF FIXTURES. For best results, G-E MAZDA "F" lamps are recommended for use only with equipment providing good power factor . . . fixtures such as Fleur-O-Liers or RLM industrial units.

NEW REDUCED PRICES

EFFECTIVE JUNE 1, 1940

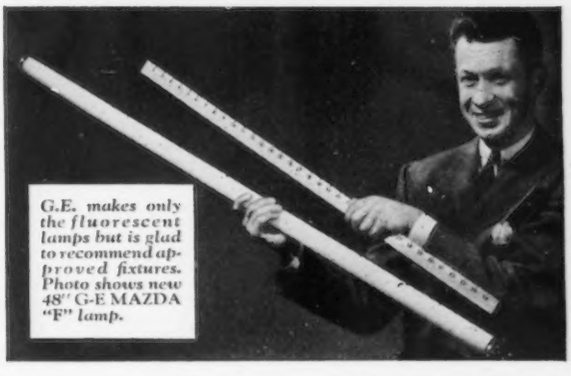
ON MAZDA "F" (*fluorescent*) **LAMPS,** *daylight and white*

	was	now		was	now
15 watt T-8	$1.15	.95c	20 watt T-12 ..	$1.65	$1.25
15 watt T-12 ..	1.45	$1.25	30 watt T-8	1.50	1.25
			40 watt T-12 ..	$2.30	$1.90

Prices also reduced on blue, green, pink, gold, and red "F" lamps.

NEW LOW PRICES ON MAZDA "C" (*filament*) **LAMPS FOR INDUSTRY**

	was	now		was	now
60 watt.....	15c	13c	500 watt	$1.20	$1.10
200 watt.....	30c	27c	750 watt	3.75	$3.25
300 watt (med. base)	50c	45c	1000 watt	4.00	$3.50



G.E. makes only the fluorescent lamps but is glad to recommend approved fixtures. Photo shows new 48" G-E MAZDA "F" lamp.

G-E MAZDA F LAMPS

GENERAL ELECTRIC

→ **NOTE:** For best results with fluorescent lighting, General Electric recommends that customers see their local electric service company for lighting suggestions and help, and that they see their G-E MAZDA lamp distributor for fixtures and lamps.

is aware of the matter, that whatever profits are made, most of them will be retrieved through taxation. The heavily increased national defense taxes just enacted are only a starter.

In contemplation are taxes on corporations that will run as high as 88 per cent on incomes of $1,000,000,000. Overhauling of the entire tax structure definitely will be undertaken at the next Congress, regardless of the Administration in power, and they will be extremely onerous from the low to the high income groups, both individuals and corporations. There is already talk in Congress, and it is more widespread than is generally realized, of following the pattern of the British government and levying a 100 per cent tax on excess profits. While it is doubted that such a levy is probable in this country, growing discussion of the proposal, though it may now be only political fodder, is pointed to as a significant trend. The easy way of government pap, handouts and so-called liberalism, which have brought about a world catastrophe apparently is at least checked. For some countries it is too late.

There still is insistence in this country on social gains, but if this country finds itself facing a disaster it is freely predicted that these, too, will be cast aside and the nation buckled down to a grilling job for all groups, capital, labor, agriculture, and so on. The noisy political opportunist will be silenced.

Arsenal Employees Drop to 40-hr. Week

Rock Island, Ill.

• • • **Though the arsenal** here is working on a 7-day week, employees are still working only 40 hr., according to a recent order. It was originally planned for employees to work 48 hr. each week, but since this number of hours was contrary to the social program of the New Deal, it was dropped and a return was made to the 40-hr. week.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

SHOP OFFICE
THAT NIGHT BOSS WEARS SMOKED GLASSES SO TH' GANG CAN'T TELL IF HE'S ASLEEP
TH' LAST NIGHT BOSS TRIED THAT, BUT SOMEBODY CALLED TH' UNDERTAKER AN' HE HAD TO WALK BACK FROM TH' MORGUE -- SOMEBODY WILL BE CALLIN' A CHIROPRACTOR FER THIS BABY!
COPR. 1940 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.
THE BLINDERS
J.R.WILLIAMS 6-28

Government Orders

Washington

• • • Government contracts for iron and steel products, as reported by the Labor Department's Public Contracts Division for the week ended June 8, 1940, totaled $1,669,039. For the same period, contracts for non-ferrous metals and alloys aggregated $226,924 and for machinery, $336,565. Details follow:

Machinery

I. J. White Co., New York, bakery equipment, $16,044; The Champion Machinery Co., Joliet, Ill., bakery equipment, $11,731; The Henry Walke Co., Norfolk, Va., press brake machines, $16,269; Harnischfeger Corp., Milwaukee, hoist trolleys, $10,213; Caterpillar Tractor Co., Peoria, Ill., tractors, trailbuilders, $26,378; National Broach & Machine Co., Detroit, profiling machines, $24,960; United States Motors Corp., Oshkosh, Wis., power units, $104,800; The E. A. Kinsey Co., Cincinnati, engine lathes, $28,731; Osborne & Sexton Machinery Co., Columbus, Ohio, shop equipment, $10,680; Lidgerwood Mfg. Co., Elizabeth, N. J., winches, $13,392; Ingersoll-Rand Co., Washington, D. C., air compressors, $10,600; Worthington Pump & Machinery Corp., Cincinnati, air compressors, $17,470; Henry Prentiss & Co., Inc., New York, precision lathes, $45,295.

Iron and Steel Products

Morris, Wheeler & Co., Inc., Philadelphia, corrugated roofing, $57,812; Crane Co., Washington, D. C., pipe and fittings, $42,421; Treadwell Construction Co., Midland, Pa., steel barger, $16,000; American Steel & Wire Co., Columbus, Ohio, preformed cable, $19,257; The Baldwin Locomotive Works, Eddystone, Pa., forgings for shell, $240,272; Gilbert & Barker Mfg. Co., Springfield, Mass., parts for rifles, $23,701; Lalance & Grosjean Mfg. Co., Washington, D. C., milk cans, $12,068; Columbia Steel Co., Seattle, steel span, $10,084; Crown Can Co., Philadelphia, cans, $29,845; National Can Corp., cans and pails, $26,255; Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., forgings for shell, $123,759; Stockham Pipe Fittings Co., Birmingham, Ala., machined shell, $69,957; The Wheland Co., Chattanooga, Tenn., machined shell, $66,758; Standard Pressed Steel Co., Jenkintown, Pa., heads for primers, $15,760; Consolidated Steel Corp., Ltd., Los Angeles, demolition bombs, $109,626; Omaha Steel Works, Omaha, machined shell, $161,658; United States Steel Export Co., Washington,

D. C., reinforcement bars, $12,166; Tennessee Coal, Iron & Railroad Co., Birmingham, Fairfield and Ensley, Ala., steel, rails and tie plates, $11,763; Philips & Davies, Inc., Kenton, Ohio, gates, $43,563; The Colorado Fuel & Iron Corp., Denver, forgings for shell, $251,674; Key Co., East St. Louis, Ill., machined shell, $164,205; W. C. Norris Mfg., Inc., Tulsa, Okla., machined shell, $76,689; Aircraft Hardware Mfg. Co., Inc., New York, steel turnbuckles, $10,829; Ideal Clamp Mfg. Co., Inc., Brooklyn, hose clamps, $14,654; Republic Steel Corp., Cleveland, steel plates, $17,350; Nashville Bridge Co., Nashville, Tenn., steel towers, $24,412; Slag Co., Davenport, Iowa, jacks, $16,492.

Non-ferrous Metals and Alloys

Chrysler Corp., Detroit, cartridge cases, $154,082; Aluminum Co. of America, Washington, aluminum conductor, $57,467; Aluminum Co. of America.

↓ ↓

Navy Department Awards for Week

Washington

• • • **The Navy Department's** Bureau of Supplies and Accounts for week awarded contracts to these companies:

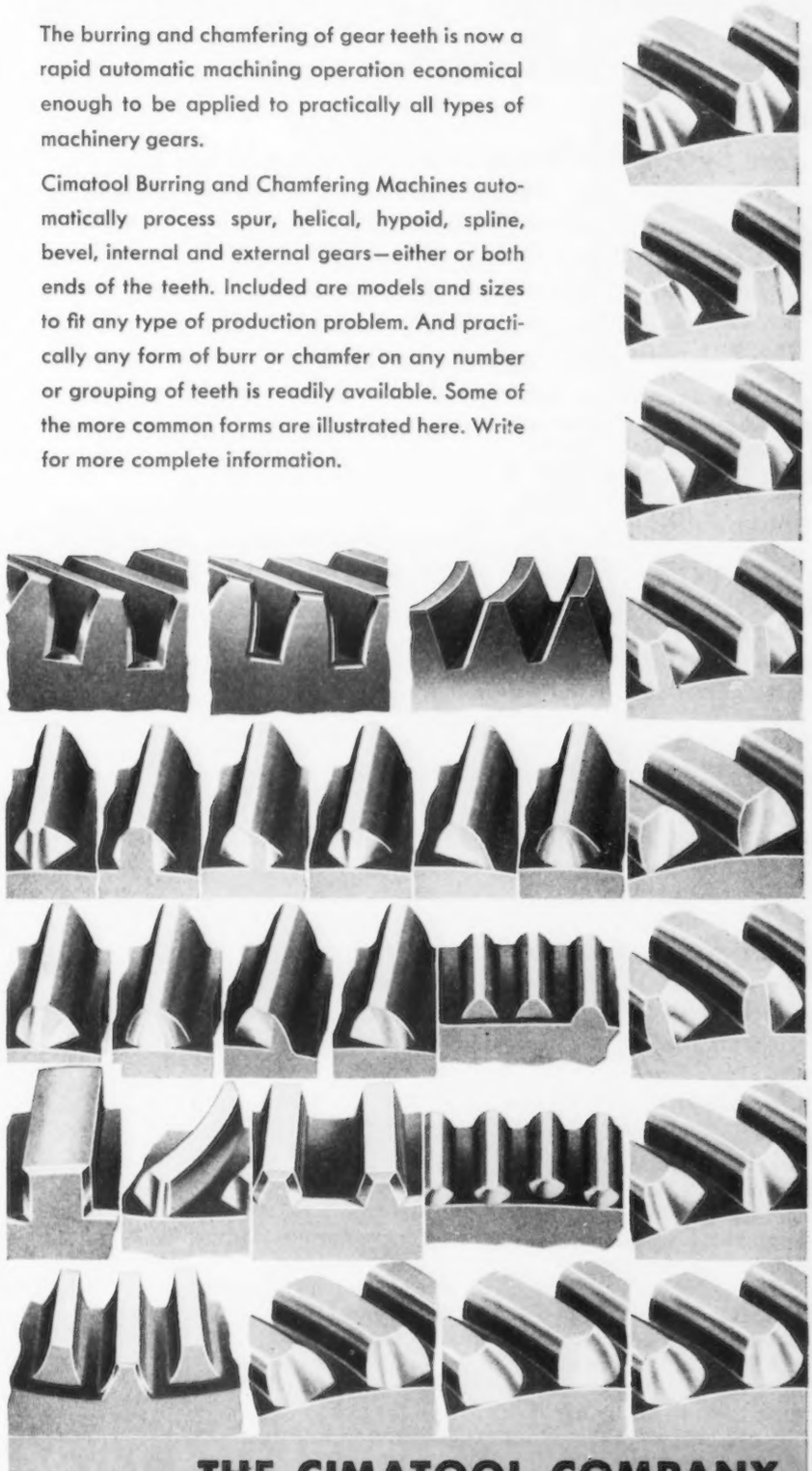
Norris Stamping & Mfg. Co., Los Angeles, cartridge containers, $333,728; Sheet Metal Manufacturing Division of Reliance Steel Corp., Youngstown, Ohio, steel, $7549; Bendix Aviation Corp., Marine division, Brooklyn, power transfer panels, $17,060; Evans Products Co., Detroit, sections for dummy powder charges, $28,169; Standard Steel Spring Co., Allegan, Mich., universal joints, $5073; Hackensack Cable Corp., Hackensack, N. J., cable, $11,773; John A. Roebling's Sons Co., Trenton, N. J., cable, $13,096; United States Steel Export Co., New York, cable, $7500; Chase Brass & Copper Co., Inc., Waterbury, Conn., brass pipe, $54,079; Cooper-Bessemer Corp., Mt. Vernon, Ohio, supercharger, $8780; United States Gauge Co., New York, valves, $9350; and the Sperry Gyroscope Co., Inc., Brooklyn, control units, $12,770.

Consolidated Shipbuilding Corp., New York, labor and material on harbor tugs, $979,552; Phelps Dodge Copper Products Corp., New York, cable, $20,031; American Steel & Wire Co. of New Jersey, cable, $10,427; Blaw-Knox Co., Pittsburgh, stands and drill jig, $19,478; International Nickel Co., Inc., New York, forgings, $10,649; Electric Heater Co., Bridgeport, Conn., barrels with rod and eye, $29,074; Westinghouse Electric & Mfg. Co., Washington, gear, $23,156; and the Bethlehem Steel Co., Shipbuilding division, Quincy, Mass., blading material, $6,950; Silent Hoist Winch & Crane Co., Brooklyn, crane, $5,420; and the E. I. du Pont de Nemours & Co., Wilmington, Del., trinitrotoluol, $543,420.

Automatic BURRING AND CHAMFERING OF GEAR TEETH

The burring and chamfering of gear teeth is now a rapid automatic machining operation economical enough to be applied to practically all types of machinery gears.

Cimatool Burring and Chamfering Machines automatically process spur, helical, hypoid, spline, bevel, internal and external gears—either or both ends of the teeth. Included are models and sizes to fit any type of production problem. And practically any form of burr or chamfer on any number or grouping of teeth is readily available. Some of the more common forms are illustrated here. Write for more complete information.



Cimatool

THE CIMATOOL COMPANY

Dayton, Ohio, **U.S.A.**

DIEMAKERS • MACHINE TOOLS • TOOL MAKERS

Fatigue Cracks

BY A.H.DIX

Rose by Another Name Smells

• • • Our new name, "Fatigue Cracks," has aroused much enthusiasm. Tom (the J. B. Ford Sales Co.) Blair writes, *"Three juicy Bronx cheers for that offensive new name. What 'brass hat' hung that on you?"* Norvin E. Green, president of the Louisville Car Wheel & Railway Supply Co., thinks it is too bad the typesetter didn't drop one of the "n's" in "punny." Ed (Carboloy) Howell says *"It's terrible."* Among the more favorable comments are, *"Too subtle," "Not subtle enough," "A big mistake."*

The only discordant note in the symphony of disapproval was sounded by H. M. Oshry, who goes off the deep end with this, *"Nice title that 'Fatigue Cracks.'"* No one wrote, *"We think a better title would be. . . ."*—but then again you don't have to be able to lay an egg to qualify as a critic of an omelet.

Marigolds and Micrometers

• • • A Chevrolet press release informs us that the third generation of workers is taking its place in the automotive industry, giving automobile buyers the benefit of inherited skill—quote—a natural aptitude, transmitted from father to son—unquote.

As an example, says the press release, John Bruce is chief inspector in the Tarrytown, N. Y., Chevrolet plant, and his father now has charge of the greenhouse at the Flint plant.

Blood will tell.

Mind-Reading Camera

• • • Henry Ford in a typical contemplated pose as he listened. . . .—*Caption on photo in* THE IRON AGE.

They waited till he made up his mind.

Our Day

• • • As we opened the door of the Washington office last Friday, Jim Ellis, one of your favorite family journal's Capital editors, was leaving to attend a press conference with the Great White Father. He asked us to go along, and twenty minutes later we were within ten feet of the famous foot-long cigarette holder.

The President sat at his desk in his shirt sleeves; "F.D.R." was embroidered in blue on the left sleeve, matching a blue tie. Three guards stood in back of him and three more sat on a couch at his right. It seemed to us they kept staring at us. We didn't know what to do with our hands. Our rose fever was bothering us, but we were afraid to reach for our handkerchief.

After he spoke from notes for about five minutes, he answered questions for the next half hour. Jim Ellis asked one about possible embargoes. The informality of the conference amazed us. The reporters seemed to us to have so much more freedom than we did when we used to report the meetings of the Totowa (N. J.) Borough Council for the *Paterson Morning Call.*

But it would be nice if they had chairs. As it is now the reporters have to write standing up, wedged shoulder to shoulder. It is a miracle that they get their facts straight, for the questions are fired with Garand rifle rapidity. They should have chairs with a wide writing arm on the right, and one with the writing arm on the left for L. W. Moffett, your senior Washington eyes and ears (see "This Week in Washington," page 56), who is a southpaw.

Not Enough Paint

• • • It was "Moff" we chided a few weeks ago for the flawed metaphor *"He etched a canvas of desolation."* You *paint* a canvas, we pointed out constructively. A. W. M. writes captiously:

> "While you're extolling that proofroom, why didn't they stop you from 'gilding' the lily? They know it should be 'paint' even if you don't."

War Note

• • • An anonymous Pittsburgher postcards:

> "'If Germany wins the war. . . .'—the caption on the photograph on page 76 of the June 13 issue—it might be because she has men who can throw 'hand grenades' that look like 105 mm. anti-aircraft shells."

News Editor Jim Rowan says the caption is as written on the release from Germany. If the proofroom's military expert passed it they must be anti-aircraft shells.

Born Middle-Aged

• • • Bill Sherman, who fathers "This Week on the Assembly Line" (page 52), sends in this from *The Detroit News*:

> The swift obsolescence of fighting aircraft brings to mind a certain motor car, now defunct, of which it used to be said that it was manufactured second-hand.

Jeremiah

• • • John Mapes of the American Iron and Steel Institute just telephoned that this sentence on page 41 of last week's issue gives him the jitters:

> Germany's lead (in aluminum) will be maintained over the few years to come.

Pardon the ominous definite article.

Puzzles

• • • Five cats will do for last week's hundred rats.

Donald W. (Westinghouse) McGill thinks twelve minutes is enough for this:

North
S—A 10 6 4
H—Q 7
D—A
C—None

West
S—None
H—10
D—Q 9 7 6 2
C—7

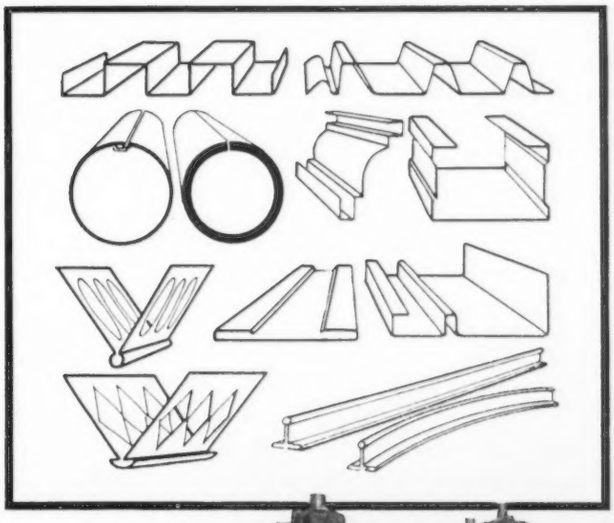
East
S—K Q 9 2
H—6
D—None
C—J 5

South
S—3
H—2
D—K 10 3
C—K 10

Hearts trump. South leads and takes six of the seven tricks.

McKAY

Cold Roll Forming Machines



From the smallest to the largest, the design features are included which make McKay equipment superior in quick change-over, low maintenance, high production and long life. This includes:

1. "McKay McKrometer" roll pressure adjustment and recording of correct settings.
2. Single speed, two or three speeds or variable speed to give required flexibility in meeting your production requirements.
3. Unit removable guide and straightener assemblies which can be changed without distrurbing vital settings.

PRODUCTS

Budd-McKay Sheet Processing Machines
Two and Four Hi Levellers
Cold Forming Machines
Scrubbing Machines
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Strip Uncoilers
Strip Recoilers
Scrap Bundlers
Up-Cut Shears
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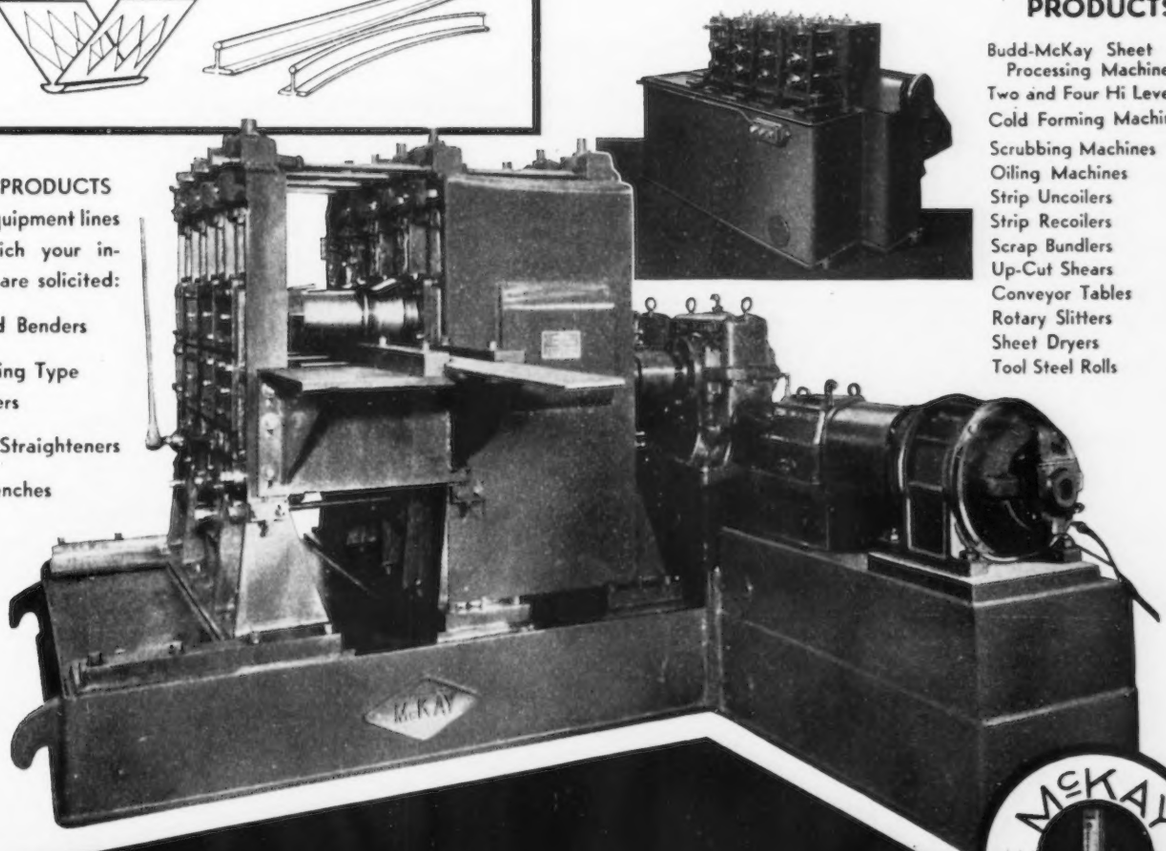
Rotary Slitters
Sheet Dryers
Tool Steel Rolls

NEW PRODUCTS

New equipment lines for which your inquiries are solicited:

Pyramid Benders
Wrapping Type Benders
Shape Straighteners
Drawbenches



McKAY McKROMETER ADJUSTMENT

THE McKAY MACHINE CO

ENGINEERS AND MANUFACTURERS OF SHEET, TIN AND STRIP MILL EQUIPMENT

YOUNGSTOWN, OHIO

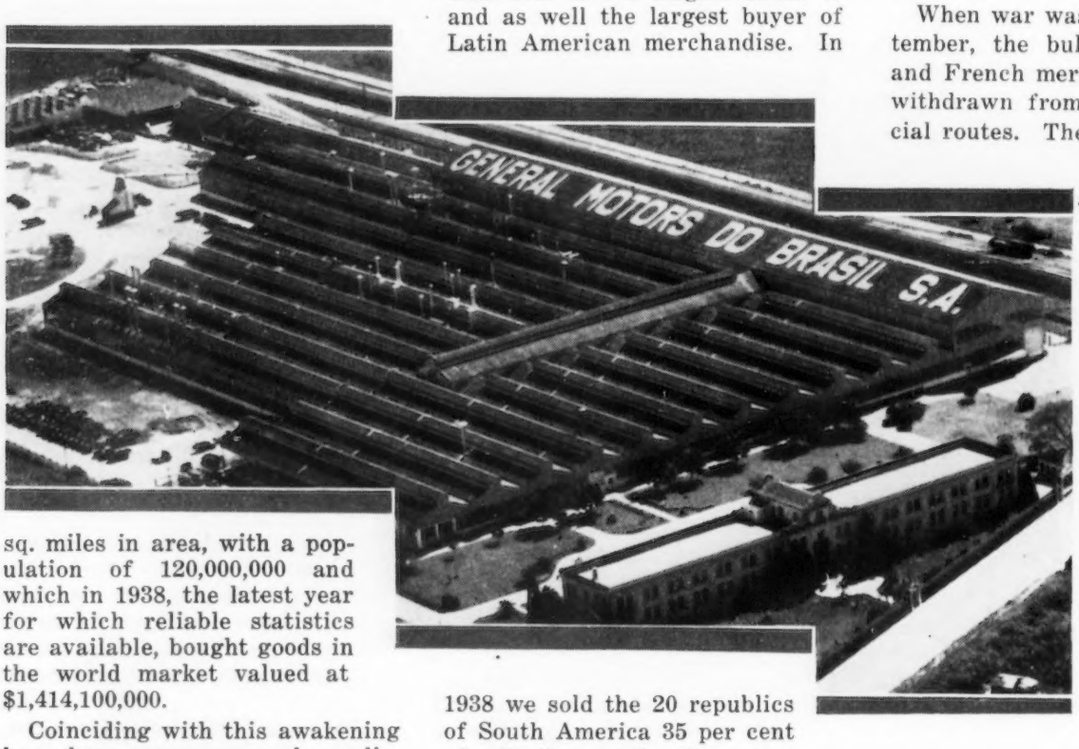
News of Industry . . .

Industry Looks to South America For Markets in World Torn by War

By WILLIAM A. PHAIR

o o o

• • • **With Europe engulfed** in conflict, and blockade and counter blockade completely disrupting normal international commerce, the United States metal industry, seeking outlets to replace those shut off by war, has reawakened to the fact that below the Rio Grande lies a continent 7,800,000 sq. miles in area, with a population of 120,000,000 and which in 1938, the latest year for which reliable statistics are available, bought goods in the world market valued at $1,414,100,000.



STAKE OF THE U. S. in Brazil, largest South American republic, is symbolized by General Motors Corp.'s large assembly plant (pictured above), at Sao Paulo, Brazil. The plant is operated chiefly by Brazilians, managed by Americans.

Coinciding with this awakening have been numerous rash predictions of the potentialities of Latin American trade. Sober judgment of history and the multiple problems involved indicates that while some temporary increase in exports to the Pan-American republics is inevitable, there are certain basic obstacles which must first be overcome if a sustained improvement in inter-America trade is to be realized.

Latin American trade has long been a thorn in Uncle Sam's side. Under the Monroe Doctrine he took upon himself the duty of policing the Western Hemisphere. It soon became apparent that many of the peoples on that hemisphere were not particularly anxious to be saved by Uncle Sam. His efforts to cultivate their cooperation have met with only moderate success.

The United States is, and has been for some time, playing the dual role of the largest seller to and as well the largest buyer of Latin American merchandise. In 1938 we sold the 20 republics of South America 35 per cent of all the goods they purchased and bought from them 31 per cent of all the material they sold.

Up to 1913, Great Britain held the largest share of this trade, but in that year the United States displaced her, just as the first World War got under way.

Thus, twice in a quarter of a century, war has given the United States an excellent opportunity to further its commerce with Latin America. If the first opportunity is suitable for forming a basis of forecasting, then the consequence of the second opportunity, will be a sharp temporary gain in trade, part of which will be retained indefinitely, but most of which will be lost as soon as peace is declared. Adding to the normal obstacles to expansion of trade in that direction, the pressure of barter trading and other financial boondoggling which will be faced regardless of the outcome of the war, the difficulty of holding the gains resulting from the war are indeed great.

When war was declared in September, the bulk of the British and French merchant marine was withdrawn from normal commercial routes. The British blockade effectively stagnated German maritime activities. Two weeks ago, Italy's entry into the conflict eliminated this nation from Pan-American trade. Thus, of the six principal nations buying and selling in South America, only Japan and the United States are in a position to do business.

On the basis of 1938 trade, the elimination of France, England, Germany and Italy from Pan-

American trade creates a void of about $500,000,000.

Already there are indications that a part of this void is being filled by United States. In the first six months of the war (September, 1939, to February, 1940). United States exports to the 20 Latin American Republics increased to $359,665,000 from $234,201,000 in the comparable period of 1938-1939, a gain of 53.6 per cent.

Under the same impelling forces, our imports from those countries in the first six months of the war rose 32 per cent to $293,915,000.

The classification of metals and manufactures thereof accounted for more than a third of the increase in United States exports to Latin America in the six months' war period, amounting to $75,372,000. The chief items which made up the increase in this classification were iron and steel sheets, bars and rods, wire and wire products, and tubular goods. The heavier operations of the meat packing plants in Argentina has resulted in a heavier demand for tin plate. Exports of railroad equipment were also larger, some of the increase being due to reordering from United States makers, equipment previously ordered from European makers but undelivered because of the war.

At first glance, it might appear that the comparatively greater rise in exports reflected good salesmanship. Actually, this unfavorable ratio greatly aggravated one of the outstanding obstacles to achieving a sustained improvement . . . the lack of dollar exchange on the part of the southern republics.

There is only one way for the Latin American countries to obtain exchange, and that is by selling their products. If a nation persists in buying more than it sells, economic collapse is inevitable. And that is what the Latin American republics are facing.

At the moment it appears that solution to this problem rests in the hands of American manufacturers if they are desirous of holding the gains already made in the Latin countries.

The spirit of nationalism, and the accompanying desire for self-sufficiency, burns brightly in many Latin American nations. Many of these countries are rich in natural resources, but lack the engineering skill and finances to capitalize upon these resources.

The possibility of American capital being used to assist in the expansion of the industries of these countries may be even less probable today than it has ever been. The experiences of the oil companies in Mexico, together with some of the recent pro-German utterances of several Latin American leaders, are effective barriers to the flow of United States' private capital southward.

The Government's contribution to the solution of this question has been in the form of reciprocal trade agreements. Such pacts are already in force in Cuba, Brazil, Honduras, Columbia, Guatemala, Ecuador, Venezuela and several other smaller countries. It appears, from a statistical viewpoint, that these agreements have had some beneficial effect upon trade with those countries, but apparently the situation requires much more drastic steps to force a solution.

It is quite likely that the Government, through either the Export-Import Bank or the RFC, will step in and finance trade expansion as a step in its Good Neighbor policy. The Government's actions, however, will be motivated primarily by political, rather than economic considerations.

A plan has been put forward by the Government to create a gigantic trading corporation to act as a central sales force for the United States and Latin American exports. Vesting this control strictly in American hands would, it is claimed, help control the political activities of eastern nations outside the western hemisphere, and at the same time would facilitate, and possibly expand, trading between the various nations of the western hemisphere.

There are other problems militating against immediate trade expansion, such as the lack of shipping space, excessively high rates on such shipping as is available, establishment of credit, location

Coming Meetings

June 24 to 28—American Society for Testing Materials, 43rd annual meeting, Atlantic City, N. J.

June 25 to 29—Production and Machine Tool Show, Cleveland.

July 22 and 23—Institute of Scrap Iron and Steel, mid-year meeting, Buffalo.

Sept. 3 to 6—American Society of Mechanical Engineers, fall meeting, Spokane, Wash.

Sept. 24 to 27—Association of Iron and Steel Engineers meeting and exhibition, Chicago.

Oct. 21 to 25—National Metal Congress, Cleveland.

of new sources, etc. But these are hindrances that can be overcome in time. Hence, at the moment, the prime problem is to provide means of disposing of the products of South America to provide exchange.

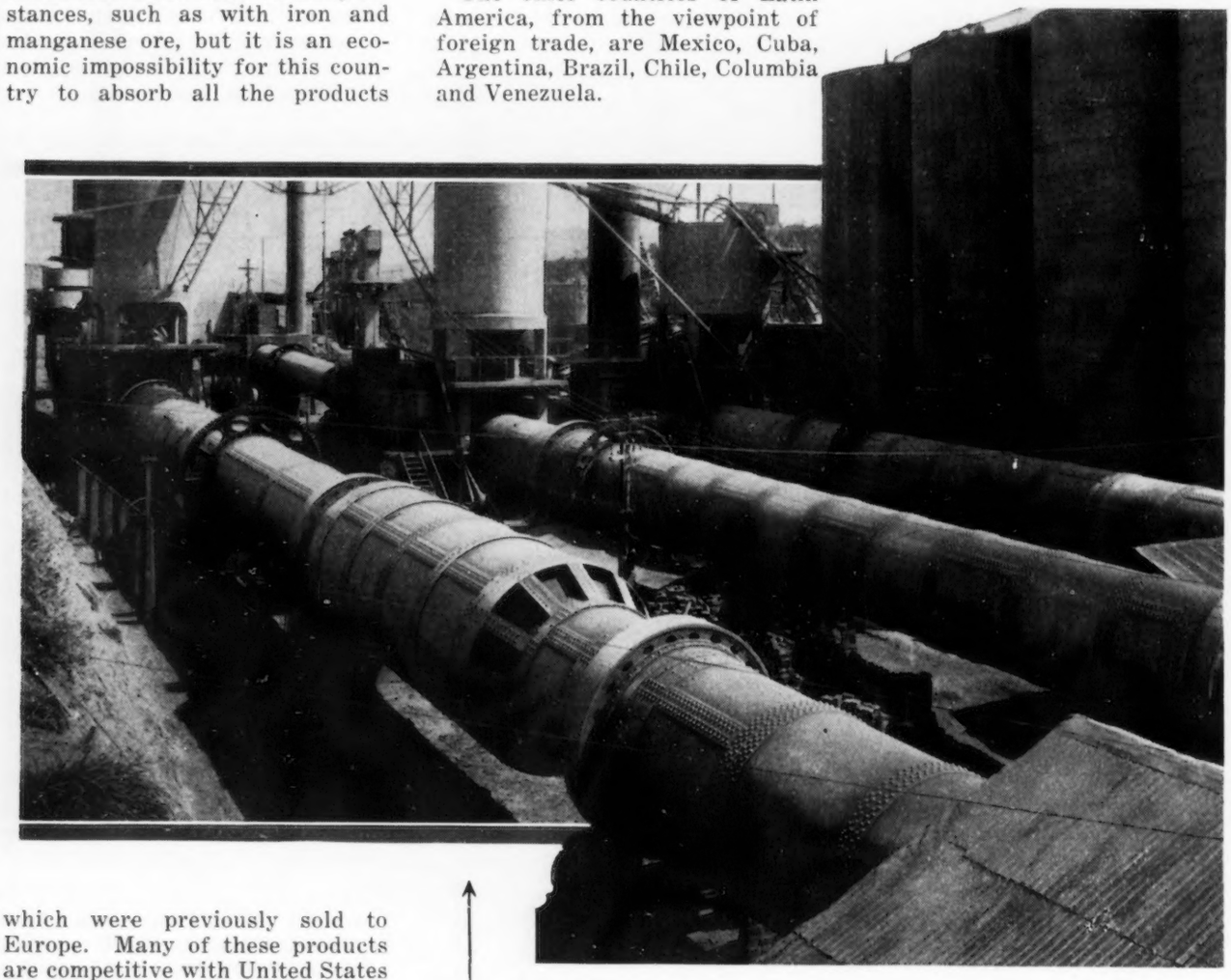
The war has forced United States to increase its purchases in the southern continent in many instances, such as with iron and manganese ore, but it is an economic impossibility for this country to absorb all the products which were previously sold to Europe. Many of these products are competitive with United States exports, as wheat, cotton, meat products, etc.

Germany overcame the exchange problem to some degree by unorthodox barter deals. Italy subsidized its aircraft industry to provide an entré into Latin America via low priced airplanes. With these deals, there also tagged along greater political influence for those two countries.

Reflecting the drive to greater industrialization, the chief demand from Latin America, so far as the metal industry is concerned, is for capital goods, such as railroad rolling stock, power machinery, electro-technical equipment, steel mill equipment, etc. Probably for many years to come, the chief demand will continue to emphasize these items.

But the industrialization process is moving forward so slowly, there will continue to be a large demand for finished metal items and steel and iron.

The chief countries of Latin America, from the viewpoint of foreign trade, are Mexico, Cuba, Argentina, Brazil, Chile, Columbia and Venezuela.



THIS CEMENT plant, a unit of Cia. Brasileira de Cimento Portland, has an annual capacity above 1,000,000 tons. It is at Sao Paulo, Brazil.

o o o

Automobiles, rayon thread, machinery parts and tubular steel products are Mexico's heaviest imports. Principal Cuban demand is for cereals and flour, cotton, machinery, vegetable fibres and iron and steel manufactures in the order named. Argentina is a particularly large buyer of iron and steel products (principally from England in the past), textiles, combustibles and lubricants.

Brazil's heaviest imports are machinery, and tools, followed in value by wheat and iron and steel products. Automobiles, trucks and motorcycles are also important imports with Brazil. Chile's chief interest is in railroad stock equipment, trucks, textiles and industrial equipment. Unfabricated iron and steel was the fourth largest imported commodity in 1938 in Chile. Columbia also imports sizeable amounts of machinery and transportation equipment. Venezuela is also chiefly interested in machinery and metal products, with textiles and foods ranking as third and fourth largest import items in 1938.

Congress Weighs Limit On Profits

Washington

• • • **What defense** orders will mean to industry in the way of limitations on profits, new taxes and governmental assistance in the form of loans and advances on orders is being widely discussed in Government circles as the defense program takes more definite form.

Taking his cue from President Roosevelt's assertion that there should be no "war millionaires," Secretary of the Treasury Morgenthau at a recent press conference turned thumbs down on a Congressional proposal that a 20 per cent annual depreciation allowance be made on special plants built for defense orders. Mr. Morgenthau, declaring that such a provision obviously would increase profits considerably, recommended that an accompanying provision should be made for a tax on profits exceeding a certain percentage.

The Secretary of the Treasury expressed no particular desire for such an excess profits tax at this session of Congress, but he indicated that he would have no objection to enacting such a provision if Congress were so disposed.

The existing limitation on profits is imposed under the Vinson-Trammel Act which limits profits on naval vessels to 10 per cent and on aircraft to 12 per cent; but in a move to expedite shipbuilding construction, the House has approved the Vinson-Walsh bill which contains a provision exempting contracts of $25,000 or less from the profit limitations imposed by the Vinson-Trammel Act.

Because the House-approved tax bill, levying $1,004,000,000 in additional taxes to finance the defense program, would provide only about 20 per cent of the cost of the rearmament plans to date, there is some talk of the possibility of a general overhauling of the tax structure in the event Congress continues in session.

As passed by the House, the pending tax measure raises the statutory debt limit from the present $45,000,000,000 ceiling to $49,000,000,000 and contains both permanent and temporary revisions in the revenue law. It broadens the income tax base and adds more than 2,000,000 new taxpayers to the Federal income tax rolls; provides for a 1 per cent increase in the corporation tax rate structure; and stipulates that a general increase be made in surtaxes on individual incomes above $6,000 a year.

An unsuccessful attempt to send the bill back to the House Ways and Means Committee for the purpose of writing in an excess profits tax on manufacturers of arms, ammunition and materials of war was made shortly before the bill was passed by the House, but committee members explained that special attention would subsequently be given to the subject. They indicated that because of its complications an excess profits tax was not included in the pending emergency tax measure.

Both the Secretary of War and the Secretary of Navy would be authorized under pending defense legislation to make advances to contractors to the extent of not more than 30 per cent of the contract price—the advances to be covered by adequate security. More than 1000 applications for Government-financed plants have been received by the War Department.

Japan's Steel Prices To Rise

Washington

• • • **Reports in the Japanese** steel trade said because of the rising price of imported materials, particularly scrap iron, the official price of iron and steel products was to be increased in June, according to the American Commercial Attache, Tokyo. The government is said to have considered subsidizing the iron and steel industry in order to prevent the necessity of advancing prices, but as between 200 and 300 million yen were required, the plan was abandoned in favor of an increase in official quotations. Reports indicate also that the government will insist on a futher reduction in dividends of iron and steel companies. The current exchange value of the yen is approximately 24c.

U. S. Completes Tanker Program

Washington

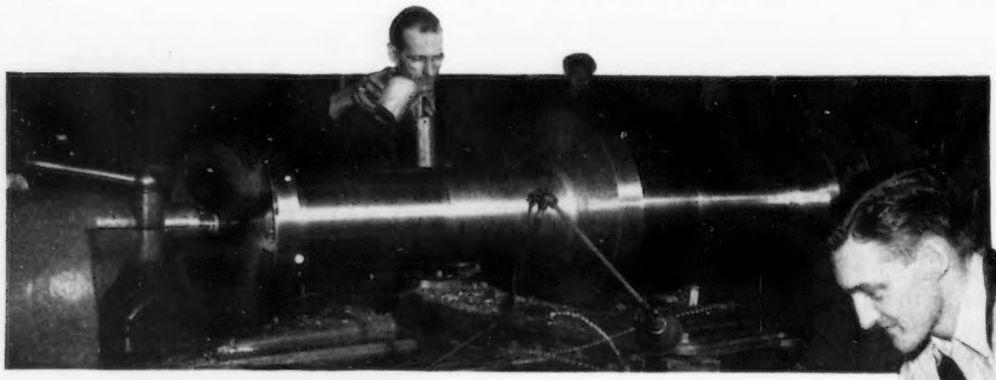
• • • **With award of contracts** for construction of three single screw national defense tankers to the Sun Shipbuilding & Dry Dock Co., Chester, Pa., the Maritime Commission has completed its original tanker program conceived as one of the first requirements for rejuvenation of the American merchant marine. Two of the vessels will be built for Seamar Tankers, Inc., and one for Kaymar Tankers, Inc., both of Philadelphia, affiliates of the Keystone Tankship Corp. The commission will pay national defense costs on these.

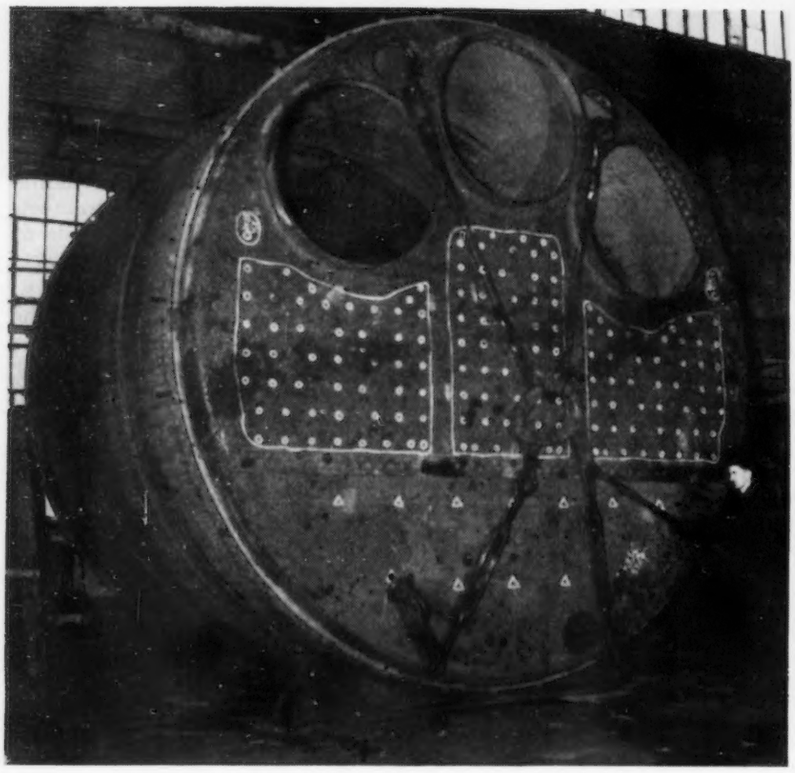
In addition to the construction of 23 high speed national defense tankers, with sufficient speed to accompany the fleet, the program has resulted in bringing commercial tanker standards up to a level very nearly approaching Navy requirements on many of the tankers under construction for various oil companies, the commission announced. Whereas before the program was begun in 1938, commercial tankers had an average speed of 12 knots, many major oil companies have now raised tanker speeds on their new vessels to from 15 to 16 knots.

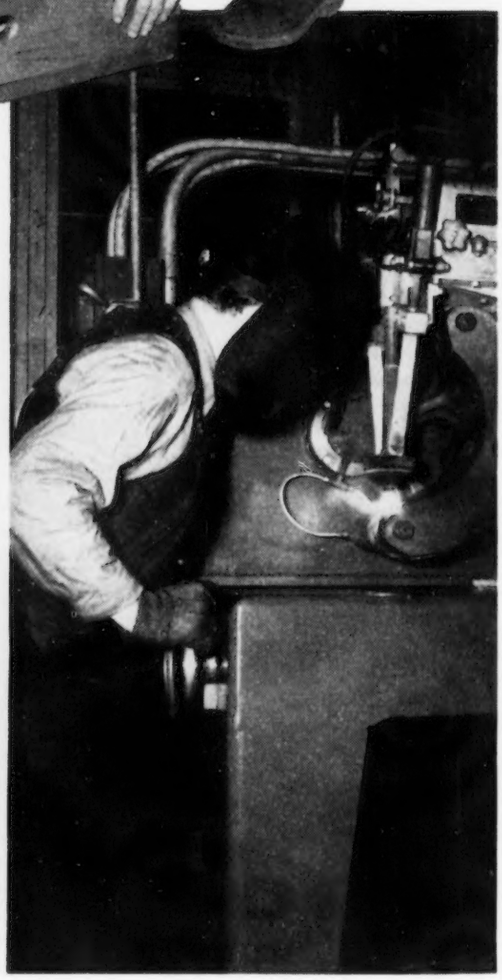
Rear Admiral Emory S. Land, U. S. N., retired, chairman, commented: "The major oil companies of the country have given the United States Maritime Commission excellent cooperation in meeting the national defense needs of the country with respect to naval auxiliary refueling ships."

"During the execution of the tanker program, prices and costs to the government were steadily reduced," said a commission statement. "On the first group of 12 screw tankers, the price was $3,129,667 per ship with the commission paying $880,000 per ship for national defense costs, primarily the additional speed. On the next six vessels of the single screw type the price was $2,687,000 each with the commission paying $450,000 per ship for national defense features. On the last five, also single screw, the price will be $2,620,000 with the commission paying $308,000 per ship.

Canada's Rearming Industry







13 Plants Soon To Manufacture Shells in Canada

Ottawa

• • • **Construction on two** munitions projects, one an $8,000,000 shell-filling plant, has been started "somewhere in Canada," C. D. Howe, Dominion Minister of Munitions and Supply announces.

The shell plant, which will be operated by Canadian Car & Foundry Co., is expected to be rushed to completion within six months. It will provide jobs for 2500 persons and is expected to be the first unit in a series of such plants.

THESE PHOTOS, taken in Canadian plants, illustrate efforts of Dominion industry to produce war equipment on a large scale. Top left, a thrust shaft for an anti-submarine boat is being polished down. Center l. to r., workmen are painting shells and boxing Bren guns. The 16-ft. boiler, lower left, will go into an anti-submarine boat, while, lower right, magazine clips for Bren guns are being welded by means of an electric arc.

Likewise, construction of a new explosive plant which was to have been financed by the British and French also has begun, with the British Government meeting the full cost of $12,000,000. This plant, which will employ some 2000 men, was originally scheduled to begin production early in 1941 but the construction schedule has been speeded up.

Announcement recently that 13 or 14 plants would soon be engaged in production of six different types of shells is but a preliminary step in a still larger program, according to Canada's Director of Public Information.

To expedite the munitions program, machine tool manufacturers of the Dominion have been instructed to increase capacity of their plants without delay. The Department of Munitions and Supply has arranged to recondition existing machine tools and convert them into the type of equipment required to meet war demands.

Construction is well advanced on several projects which will increase the output of Canada's munitions industry by several hundred million rounds a year. Anti-tank and anti-aircraft shell production has recently been increased by more than 30 per cent. Bren guns are coming off the assembly line on a mass production basis. Gun barrel forgings are being produced in increasing quantities.

Buildings on 52 of the airfields required for the British Commonwealth Air Training Plan are already in use or under construction, according to Canadian authorities.

Nickel Company's Shop Expansion to Cost $250,000

• • • **International Nickel Co.** will extend the merchant mill at its Huntington, W. V., plant for additional machine shop space approximately 80 ft. x 100 ft. Orders for the necessary equipment have been placed. Contract for construction work has been let and work will start shortly. Cost is estimated at $250,000.

Metals & Controls Corp., Forest Street, Attleboro, Mass., is constructing an addition to its manufacturing plant. Rowley Construction Co., 260 Central Avenue, Pawtucket, R. I., has the contract.

United States Electrical Motors Corp., 80 34th Street, Brooklyn, shortly will ask bids on a one-story, brick and steel manufacturing plant at Milford, Conn., to cost $100,000 with equipment.

Massachusetts Claims 250 Plants for Aviation

Boston

• • • **Few states stand** to gain as much by increased aircraft production as Massachusetts. According to the Associated Industries of Massachusetts there are 250 plants in this State that are producing for aviation or are capable of doing so immediately. Of the 50 major industries in western Massachusetts, 31 are producing aviation materials. In Springfield alone there are 16 plants so engaged.

A.S.T.E. Adds Two More Chapters in Mid-West

• • • **With the chartering** of two more chapters, at Columbus, Ohio, and Indianapolis, the roll of chapters of the American Society of Tool Engineers has been increased to a total of 37. Elected officers of the new Columbus chapter were: Chairman, R. J. Freter, chief engineer, Columbus Bolt Co.; vice-chairman, C. E. Nelson, supervisor of tools, Jeffrey Mfg. Co.; secretary, S. J. Matchett, Jr., engineer, Ranco, Inc.; and treasurer, H. M. Poole, instructor in industrial engineering, Ohio State University.

Indianapolis chapter at its charter meeting elected the following officers: Chairman, H. D. Hiatt, Allison Engineering Co.; vice-chairman, Ronald Updike, chief tool engineer, Schwitzer Cummins Co.; secretary, R. D. Harris, chief designer, International Harvester Co.; and treasurer, D. H. Chancellor of the Prestolite Co.

Pressure Castings, Inc., Awards Bonus of 8%

Cleveland

• • • **Claud H. Foster,** Cleveland inventor and industrialist who came out of retirement one year ago to take over the Pressure Castings, Inc., plant here, recently put into operation his latest profit-sharing plan. Approximately 270 employees of the firm received their first profit-sharing checks June 15. The checks, based on 40 per cent of the firm's earnings, average about 8 per cent of each employee's annual wage or salary. Mr. Foster, who amassed a fortune through production of Gabriel auto snubbers which he invented, said he would not disclose the cash amount of the distribution because "that's bad business." Profit-sharing played an important part in successfully building up the snubber business, he said.

Fostoria Screw Co., of Toledo, is Reorganized

Toledo

• • • **Fostoria Screw Co.,** formerly controlled by the Richardson Co. here, has been reorganized with Harrison McIntosh as president.

Steel Industry in U. S. Has Seldom Operated at Near-Capacity Level

By C. E. Wright

o o o

• • • **Only a few times** in its history has the American steel industry been pushed to its utmost to supply the demands made upon it, and, with the exception of a part of the period of the first World War and during eight months of 1929, the spurts to maximum or near-maximum capacity have been of brief duration —a month or two at a time.

The first World War created the largest aggregate demand for steel that the industry in the United States had experienced up to that time. While the maximum production during that period was surpassed many times thereafter, all previous annual records were broken in 1917, the year that the United States entered the war. The production of ingots and steel for castings in that year was 50,467,880 net tons, which was subsequently exceeded in 1925, 1926, 1928, 1929, 1936, 1937 and 1939.

It is interesting to note, however, that while the steel industry operated at close to 90 per cent or higher during the greater part of 1917, the requirements of war plus those for non-war purposes did not keep the industry operating at capacity during 1918. In fact, monthly operations were below 90 per cent in all of that year, and in January were only 59.16 per cent and in February only 67.60 per cent.

This statistical record of the first World War may have a bearing on the question as to what extent the needs of Britain and the United States will absorb the steel capacity of this country while the war lasts and beyond that perhaps in the supplying of our own defense requirements.

During eight consecutive months of 1929 the steel industry operated at above 90 per cent, one month (May) reaching 102 per cent of theoretical capacity. But during the entire post-war period with the exception of 1929 the steel industry has not operated for long at any such high rates.

Anything above 90 per cent is practical capacity for the steel industry. Between 1918 and 1926 the industry did not once get up to 90 per cent for a single month. It went to 90 per cent or above in only one month of 1926, in one month of 1927, in two months, not consecutive, of 1928, and, skipping 1929, it did not again achieve this record until April, 1937. There were three consecutive months of high operations in the spring of that year but in two of them operations fell a little below 90 per cent. Even in the almost unprecedented rush for steel last fall operations exceeded 90 per cent only in one month, November.

The conclusions which may be drawn from these facts are that, while war or war preparedness creates abnormally heavy demands for some steel products it does not necessarily create a demand for all of them. Even now the trend of orders and production in relation to capacity is seen to be heaviest in forging billets and bars, and alloy steels, particularly the electric furnace grades. If demand for all products were to ascend in approximately like proportions, the steel industry would have to conserve its ingot capacity, as it did during the first World War, for the products most essential to war and defense requirements.

SWOC Wants Million Members, 30-hr. Week

Chicago

• • • **At a meeting** in Gary, Ind., last week in celebration of the fourth anniversary of the founding of the SWOC, Nicholas Fontecchio, Calumet district director, said that with proper leadership and organization, the SWOC and affiliate unions could reach a membership of 1,000,000 persons. He said the ultimate aim of the SWOC is a 6-hr. day and 30-hr. week.

SPEED-UP IN A DEMOCRACY

—Shown below are two significant pictures suggesting the rapidity with which American industry is preparing for the nation's defense. The photo at the left shows a 70,000 sq. ft. addi-

ELECTRIC FURNACE INSTALLED AT ALLEGHENY LUDLUM FOUNDRY

• • • **Among improvements** at the Buffalo foundry of the Allegheny Ludlum Steel Corp. is a small electric melting furnace. This new furnace is another one of the tilting type, which rotates around the hollow electrodes similar to the larger furnaces which have now been in operation for two years. These furnaces are the only ones in the world of this particular construction, used exclusively by Allegheny Ludlum Steel Corp. for the melting of steel for stainless castings. (See THE IRON AGE, Jan. 28, 1937.)

The hollow electrode furnaces produce stainless steel castings which are remarkably free from blow-holes, and are very much easier to machine.

The new small furnace will be used to meet the increasing demand for numerous small stainless steel castings, such as impellers, mixing blades, spring supports, and aircraft castings within a weight range of 0.5 lb. to 20 lb. each.

The larger furnaces will be available for increased production of large stainless steel castings weighing several tons each, or more.

"New conveyor tables, which automatically bring the flasks under the ladle and then move on down the line for cooling, introduce the production line method of operation, resulting in greater speed and materially cutting the time generally required for deliveries on this type of stainless steel production."

The doubled capacity has resulted in a substantial increase in the number of men employed.

Van Dorn Iron Works To Make Army Tanks

Cleveland

• • • **Van Dorn Iron Works Co.** recently announced plans for immediate manufacture of street sweepers and army tanks. Plant No. 12 is being readied for government work. Armor plate will be fabricated not only for tanks but for military airplane seats and combat cars; 37-mm. gun mounts will also be made.

Tool Engineers Join Standards Association

• • • **Ford R. Lamb,** executive secretary, American Society of Tool Engineers, announces that the society has joined the American Standards Association. E. W. Ernest, chairman, A.S.T.E. national standards committee, has been appointed to represent the tool engineers on the A.S.A. Council. Mr. Ernest, who is superintendent, section A, General Electric Co., Schenectady, will also represent the A.S.T.E. on the A.S.A. mechanical standards committee with C. E. Ives, Ives Engineering Co., Chicago, as alternate on the Council, and Carl J. Oxford, chief engineer, National Twist Drill & Tool Co., Detroit, as alternate on the mechanical standards committee.

Chicago Seeks Airplane Research Laboratory

Chicago

• • • **E. P. Querl, manager,** industrial department, the Chicago Association of Commerce, was in Washington last week seeking to convince Government officials that a site in or around Chicago should be selected for the proposed Government airplane engine research laboratory. Mr. Querl emphasized the advantages of Chicago as a center of technology, its supply of skilled labor, its industrial facilities and its strategic position inland. He pointed out that 2662 firms in Chicago employing over 250,000 men are prepared for production of materials necessary to war.

tion to the Kearney & Trecker Corp. plant, Milwaukee, as it appeared in the structural framework stage on Jan. 15. Just 16 days later the addition, as shown in the photo to the right, was completed.

"OUR NUMBER ONE SALESMAN Doesn't Carry a Briefcase!"

"Here's a Tip! Get Texrope-Driven Machines. You'll Get More Business . . . and Profits, Too!"

"WE'RE AFTER extra business . . . and we're getting it! Though there was a time when jobs were few and far between. And when we did get one . . . obsolete equipment we had ate up profits so fast, it was just as likely we'd lose money as break even.

"So we cleaned house . . . threw out the old machines and installed new Texrope-driven ones.

"There was a change right away . . . once we did away with all the overhead shafting and long center belts that blocked out the light. Seemed that our workers were as cheerful and bright looking as the sunlight that streamed in the windows and flooded the shop.

"Those cool-running, silent Texrope Drives really made a hit with them . . . after having had to work around slapping belts and screeching pulleys. And they made a hit with our salesmen, too! They're able to quote on jobs they never had a chance on before. What's more . . . they're getting them.

"No wonder we call those machines our number one salesman! They're keeping our production costs down . . . they're protecting our profit margins . . . they're bringing us new orders!"

If you are looking for the more efficient operation that means lower costs and more profits . . . you'll want to know the story of why Texrope Drives have skyrocketed to first place as the most popular way to drive machines.

Call the nearest Allis-Chalmers district office or dealer for the complete facts on how you can save money in your plant . . . with genuine Texrope Drives. Texrope Drive Division, Allis-Chalmers Mfg. Company, Milwaukee, Wisconsin.

See How These Texrope Features Save You Money!

SHORT CENTERS FOR SPACE SAVING. Texrope V-Belt Drives allow you to put your source of power close to the machine being driven. There's no waste space . . . no unsightly shafts to keep out light.

INDIVIDUAL DRIVE PRINCIPLE CUTS POWER COSTS. When each machine has its own drive, you only pay for power costs when it is producing. In contrast . . . where a group of machines is coupled to a line-shaft . . . only one might be running . . . but power used is out of proportion to actual needs.

A 1237

Belts by Goodrich

AC ALLIS-CHALMERS MILWAUKEE

TEXROPE DRIVES CUT

SAFETY . . . EASILY AND ECONOMICALLY GUARDED. You eliminate danger spots when you install Texrope Drives. Because of their short centers, it's easy to slip a small, inexpensive guard over them.

FLEXIBILITY OF LAYOUT . . . EASY TO INSTALL. You don't have to change over machines or existing layouts to fit Texrope V-Belt Drives. They'll operate in practically any position without losing their efficiency . . . and they're easy to install.

SHOCK-PROOF FEATURE PROTECTS MOTOR AND MACHINE. Texrope Drives do not vibrate . . . actually absorb shocks even when the load is a pulsating one. Lower belt pull means longer bearing life . . . less service and maintenance costs.

EFFICIENCY HIGH . . . MAINTENANCE LOW. With Texrope Drives, transmission losses from motor to machine are cut to a minimum. There's no belt slip . . . no unnecessary wear and tear on belts . . . no need for belt dressing.

★ **ADEQUATE STOCKS ARE CARRIED THROUGHOUT U. S. A.**

Get Texrope Drives and replacements instantly from Allis-Chalmers warehouses and dealer stocks in all parts of the country.

TRANSMISSION COSTS

French Surrender Not Vital To U. S. Business, Col. Ayres Holds

Cleveland

• • • **Col. Leonard P. Ayres,** famed economist, said the economic consequences of the French surrender should not seriously disturb American business as a whole. He pointed out that, in any case, the combined war purchases of the Allies during the past eight months had not been up to expectations and that these orders had not until recently been a major factor in the 1939-40 business level in this country.

The collapse of France, he said, brings one step nearer the greatest disaster that Europe faces—famine.

Other aspects of the French surrender apparent here Monday included:

Steel Industry—The orders placed in this district by the French involved shell steel, both direct to France and through domestic shell makers, semifinished, bars, toluol for making T.N.T. and an order for barbed wire. Production of this material was halting here Monday. Order backlogs were believed ample to cushion the shock in most products. Considerable confusion prevailed as to what the French would be likely to pay for. Whether the material would have to be in the form specified in the contract, or whether partially completed, were the subject of debate. Contracts provide a number of stipulations, such as "sound" steel, which if strictly adhered to might cause considerable legal wrangling.

Manufacturing — A maker of trailer bodies who held a French order was prompt to cancel steel here Monday, although he had received no word from the French direct. Makers of aircraft parts were particularly perturbed, but as the French were buying American model planes, it is assumed no great permanent difficulty will be caused due to the magnitude of the United States program.

At Thompson Products Co., Inc., officials were meeting hourly to decide what to do with orders being filled for various airplane manufacturers building planes for France. The situation is perplexing for Thompson, inasmuch as some of the plants for which they are manufacturing are located in Paris, which fell into German hands last week.

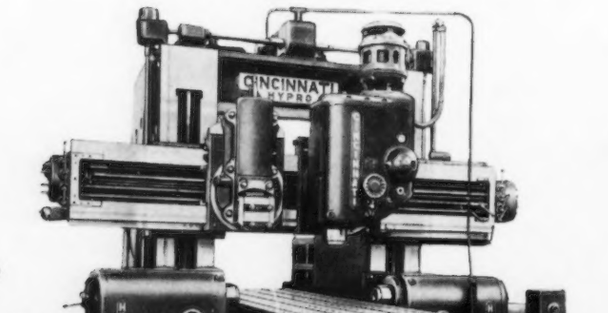
Two Cleveland manufacturers of forgings were interested in an order for 2,500,000 shells the French were about to place. One of the plants would have required about two months to prepare for manufacture. The last word received—last Friday—was that the order had not been placed.

White Motor Co. only recently received an order from France for $3,000,000 worth of trucks. Officials said a "substantial deposit" accompanied this order.

Cincinnati

HYPRO
COMBINATION PLANING AND MILLING MACHINES

Planing and Milling with Same Machine on a High Production Basis



Multiple Tools in extra heavy Planing Head used for planing Vee and Flat and rugged Milling Heads with individual 20 H.P. motors, have reduced production time over 50% on grinder beds. This is only an example of time that can be saved with a machine of this type.
Machine illustrated is of entirely new design, incorporating individually driven 9½" Quill Milling Heads providing spindle speeds of 10 to 200 R.P.M. capable of handling cutters over 18" in diameter.

A wide range of planing speeds is provided to the table through separate planer motor and control. Machine can be instantly changed from milling to planing by movement of selector switch or control handle.
If you are interested in placing precision milling and planing on the same machine, the new Hypro Combination Machine merits your close attention.

Full Particulars Sent on Written Request.
Ask for our new bulletin No. 105.

PLANERS • PLANER MILLERS • BORING MILLS
THE CINCINNATI PLANER CO.
CINCINNATI, OHIO

Defense A Job For Industry

Chicago

• • • **The board of directors** of the Illinois Manufacturers Association at their monthly meeting here recently said adequate preparedness in the United States must be accomplished primarily through efforts of "private enterprise."

To accomplish such preparedness, the directors said, private enterprise must be free from unreasonable governmental restraints as well as from further unreasonable governmental interference.

A.S.M.E. Members Hold Semi-Annual Meeting

Milwaukee

• • • **The 1940 semi-annual** meeting of the American Society of Mechanical Engineers was held here recently at the Hotel Pfister. The technical sessions of the first two days of the meeting were devoted mainly to discussions of hydraulic and power problems and education and training of employees. At one session F. O. Volz, Lakeside Bridge Steel Co., Milwaukee, discussed "The Use of Electric Welded Construction for Columns and Bases in the Machine Tool Industry" and F. J. Dost, Sterling Foundry Co., Wellington, Ohio, presented a paper on the subject of making better machine tool castings.

A railroad symposium Thursday morning, June 20, was followed by a session on machine shop practice which included a discussion of hard facing by E. E. LeVan, vice-president of the Haynes Stellite Co., Kokomo, Ind., and a description of "A New Method of Tool and Die Milling" given by Francis Trecker, Kearney & Trecker Corp., Milwaukee. Inspection trips were made to plants of Wisconsin Electric Power Co., Nordberg Mfg. Co., Allis-Chalmers Mfg. Co., and Kearney & Trecker Corp.

Engineering Societies Open Detroit Employment Office

• • • **To meet the greatly** increased demand for all types of engineers, especially in the large industrial areas of America, the Engineering Societies Personnel Service, Inc., backed by the four "Founder" engineering societies has opened a fourth regional office in Detroit. Opening about July 1, the office will be located in the Hotel Statler until such time as it can move into quarters in the Engineering Society of Detroit's building, now under construction. Louis E. Williams, a well-known engineer of Michigan, will be manager of the newly established office. Members of the staff elsewhere include Walter V. Brown, manager, New York office; Thomas Wilson, manager, Chicago office; and Newton D. Cook, manager, San Francisco office.

●With today's deeper drafts and fewer passes, roll-neck bearings carry the *big* responsibility. When one burned-out bearing means costly production delay, it's up to steelmen to forestall friction. *In the majority of America's 4-high mills, Penola does that all-important job* . . . and does it well! It will pay you dividends to call in a Penola engineer. DO IT NOW!

PENOLA LUBRICANTS
Penola Inc., Pittsburgh, Pa.
(Formerly Pennsylvania Lubricating Co.)
New York • Chicago • Detroit • St. Louis

LUBRICANTS FOR THE STEEL INDUSTRY SINCE 1885

Simon-Levand Co. is Organized at Cleveland

Cleveland

• • • **Simon-Levand Co.** has been incorporated here by Jack Levand, president of Levand & Co., and Harry Simon, former president of H. Simon Co., to engage in the sale of open hearth and foundry grades of scrap. The offices occupied by Levand & Co. in the Fidelity Building are being expanded.

Electric Truck Buying In May Slightly Lower

• • • **Domestic sales** of electric industrial trucks and tractors in May were slightly below the peak for the current year reached in April. May bookings were 101 units, as compared with 120 in April, Industrial Truck Statistical Association reports. Value of May bookings, chasses only, was $384,403, while in April it was $423,381.

Survey Made of Ohio Machine Tool Industry

Cleveland

• • • **Ohio's position** in the machine tool industry is examined in a 119-page occupational study, "The Machine Tool Industry in Ohio," released by S. Burns Weston, Ohio administrator of the National Youth Administration. The study, was made by Wilbur R. Hanawalt, NYA research assistant, took several months. It was reviewed and edited by ten persons prominent in the industry and in research work. Its purpose is to provide potential and present employees in the industry and the general public with authoritative information in non-technical terms.

Ohio's machine tool plants employ nearly one-third of all U. S. machine tool workers.

Labor Board Drops Charges Against Interlake Iron

Chicago

• • • **Charges of domination** of an independent company union on the part of the Interlake Iron Corp., have been dismissed in an intermediate report of the National Labor Relations Board. The attorney for the independent union known as the Employees Association of Interlake Iron Corp., declared that the ruling of the board represented tacit approval of the merit system of rating workers inasmuch as the company was not ordered to discontinue this system. Employees thereby are rated for ability, attention to work and other attributes including seniority. Four workers were ordered rehired.

Plant Making Seaplane Pontoons to Be Enlarged

• • • **Edo Aircraft Corp.** is planning a $125,000 addition to its plant at College Point, Long Island, N. Y. Contracts for design and construction have been awarded to the Brown & Matthews Co., New York. Scheduled for completion in eight weeks, the new plant will increase the firm's capacity for manufacture of pontoons for seaplanes from 20,000 to 40,000 sq. ft.

THEY HIT THE BULLSEYE FOR *Economy*

Less cost to install . . . less cost to operate! That has been the enviable record of Roper Pumps for years . . . and now with recent improvements economy is more pronounced than ever.

When you equip your machinery and plant with Roper Rotary Pumps you'll be impressed with their smoothness, quietness and plus-power . . . furthermore you'll know you made a smart buy when you check cost figures.

If you haven't received our new Catalog No. 941 send for it today . . . it contains a wealth of pumping information in addition to complete descriptions of the new Roper line.

ROPER
Rotary PUMPS
DEPENDABLE SINCE 1857

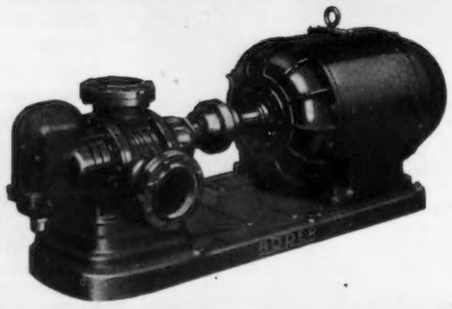
• **CAPACITIES**—1, 3, 5, 10, 15, 20, 35, 50, 75, 100, 150, 200, 300, 500, 750, 1000 gals. per minute.

• **PRESSURES**—Up to 1000 lbs. per sq. inch.

• **SPEEDS**—Direct motor speeds up to 1800 R.P.M.

• **MOUNTINGS AND DRIVES**—21 different models to meet your requirements.

• **BEARINGS**—Sleeve and roller.



GEO. D. ROPER CORP., ROCKFORD, ILLINOIS.

For short-center drives —for portable machines use Condor WHIPCORD ENDLESS BELTS for more work at less cost

Condor Whipcord Belt in largest stone crushing plant. Using this belt has eliminated previous individual drive units.

WHEREVER one of the major problems is the transmission of power from one source to various units of a machine, or of a short center drive with a pivoted motor base or idler take-up, Condor Whipcord Endless Flat Belt frequently solves the problem.

Condor Whipcord Endless Belt is so flexible, so nearly stretchless, so tough and pliable, that it can flex in either direction around a succession of pulleys and keep an entire train of them synchronized—even when overloaded for top production.

All this is because of the *7 Advantages in the scientifically designed Condor Endless "Whipcord" construction.

What the maker of the above machine says:

Gentlemen:

In building large portable rock crushing plants, we have found from experience that one of the major problems is the transmission of power to the various units in the plant. In most cases only one power plant is used and consequently a number of intermediate drives are necessary between the various units.

After learning about the possibilities of your Condor Whipcord drive belt we eliminated most of these individual drives and use one endless belt to drive all of the main units on the plant. This, of course, is a tough drive for the belt, because of the many reverse bends that the belt must make in its travel.

When first introduced, a number of our men were very skeptical as to the possible success of this drive. After several years of trial they are all completely sold on this drive. As a matter of fact, it is one of our important selling features on the plant.

We have had practically no trouble with your belts and have been unable to find any other make of belt that will stand up under this job.

Yours very truly,

Condor Endless Whipcord Belts on a planer.

*7 Advantages

1. Low ultimate stretch.
2. Length not variable with atmospheric changes.
3. High degree of bending flexibility.
4. No ply separation.
5. No splice in tension or load-carrying section.
6. Unequalled longevity.
7. Patented extensible tip prevents seam separation.

Condor PRODUCTS

- Conveyor and Elevator Belt
- Transmission Belt
- V-Belt
- Agricultural Belting
- Air Hose
- Contractors Hose
- Fire Hose
- Hydraulic Hose
- Oil and Gasoline Hose
- Sand Blast Hose
- Steam Hose
- Suction Hose
- Water Hose
- Chute Lining
- Launder Lining
- Industrial Brake Blocks and Lining
- Molded Rubber Goods
- Rubber Lined Tanks
- Rubber Covered Rolls

- Abrasive Wheels
- Bowling Balls

THE MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC. PASSAIC, N. J.

THE MANHATTAN RUBBER MFG. DIVISION

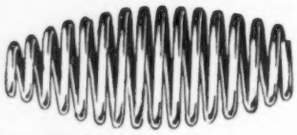
OF RAYBESTOS-MANHATTAN, INC.

EXECUTIVE OFFICES AND FACTORIES

32 Townsend St., Passaic, N. J.

the practical side of Springmaking — BY DUNBAR

Send us your problems on Compression Springs



"We don't know all about springs
BUT
All we do know is about springs"

We may suggest:

* An open end where space is limited.
* Closed ends to avoid tangling and speed up assembly time.
* Ground ends where necessary to stand squarely and compress uniformly.
* Removing set if highly stressed when at work.
* Allowing for set if compressed solid when assembling.
* Kind of material and finish.

Tell us the working length, with load spring is to carry at given length. Better still, send us the part in which the spring goes.

Dunbar Bros. Co.

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

"Quality Springs Since 1845"

Survey Finds Job Loss Due to Plant Mortality

• • • **Loss of employment** opportunities in the most important industrial areas has been due to the heavy shrinkage of the number of going plants, not mechanization, N. W. Pickering and A. W. Rucker, business economists, assert in a study recently published by Farrel-Birmingham Co., Inc., Ansonia, Conn.

The number of jobs provided by manufacturing industry as a whole declined 2.6 per cent between 1929 and 1937, the study showed, while the average jobs per going plant increased 22.6 per cent in the same period. The number of going concerns in the 18 major industrial areas covered by the survey were, in 1937, 20.3 per cent less than in 1929.

Total man-hours of work provided by the areas studied declined 23.9 per cent between 1929 and 1937, it was stated. Of that loss, the study indicates that 11.2 per cent was traceable to increased output per comparable man-year and the remaining 12.7 per cent to a decline in production arising from a shrinkage in demand. Average hourly wage rates were lifted 18 per cent in the period considered.

Toledo Edison to Spend $5,175,000 on Plants

Toledo

• • • **In anticipation of** growing demands for electrical power with the coming of the national defense program, the Toledo Edison Co. will spend approximately $5,175,000, or five times its normal annual outlay for plant improvements, this year. Previously it had been announced that $3,500,000 would be expended for additional generating equipment. Extension of power facilities to the new Lake Erie water supply system of the city and improvement of street lighting facilities are two large items.

Electro Alloys Puts Accent on Americanism

• • • **To remind American** industry of the nation's background and basic principles of freedom, equality and justice, Electro Alloys Co., Elyria, Ohio, is distributing copies of "The American's Creed," by William Tyler Page.

Rock Island Arsenal Converts Machine Guns

Rock Island, Ill.

• • • **The arsenal here** soon will begin the conversion of from 15,000 to 20,000 .30 caliber machine guns from water-cooled to air-cooled weapons. At the same time, it will begin manufacture of a large number of Browning air-cooled .50 caliber machine guns.

The apparent low bidder on 1100 scout cars, inquiry for which was reported in THE IRON AGE last week, was the White Motor Co., of Cleveland, with a bid of $4,972 a unit. The York Safe & Lock Co., York, Pa., is the apparent low bidder at $2,224 a unit on 416 carriages for 37 mm. anti-tank guns. This company was recently the successful bidder on an order for 350 of the same type carriages. The Cleveland Tractor Co., of Cleveland, was the apparent low bidder on 30 light tractors for use by the Army with a bid of $1,312 a tractor.

Private Capital to Get First Chance

• • • **"Always give private** capital the first chance," said Secretary of the Treasury Morgenthau when his attention was directed to a communication from President George L. Harrison of the New York Federal Reserve Board to the Defense Advisory Commission suggesting that private capital be employed so far as possible in the defense program.

"The Government has never competed with private capital. I think Mr. Jesse Jones always fixes his interest rates high enough so as not to compete with private capital."

Swedish Iron Port of Lulea Now Open to Reich

• • • **The Swedish iron ore** port of Lulea, on the Gulf of Bothnia, is now sufficiently free of ice for the first freighters to have entered. In the summer months Swedish iron ore exports reach Germany via Lulea and the Gulf of Bothnia.

● **Shaft 57 feet long, largest diameter 11¾ inches, weight 17,300 pounds — forged and rough machined by Standard Steel Works**

STANDARD is equipped to produce steel forgings and castings of any size and shape to suit your requirements. • • • The steel used in Standard's forgings and castings is acid open hearth, produced in our own furnaces under close metallurgical control.

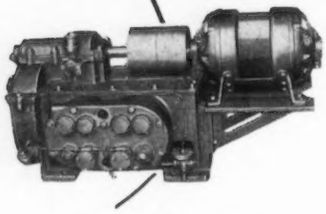
CASTINGS • FORGINGS • WELDLESS RINGS • WROUGHT STEEL WHEELS

STANDARD STEEL WORKS

Division of THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

BLH THE BALDWIN GROUP

. . . . Outstanding
PERFORMANCE
"All-Purpose"
AIR . . .
COMPRESSORS
★ Efficient
★ Reliable
★ Durable



Type "N" Compressor

Two cylinder, single-stage, single acting, gear driven. Air-cooled for intermittent operation, "NB"; water-cooled cylinder heads for continuous operation, "NWB". Has positive and reliable unloader for A.C. motor drive. Sizes 12½ to 100 cu. ft. Pressures from 30 to 150 lbs. Catalog T2048. Write for information and prices.

Many other types and sizes available, up to 200 cu. ft. . . . There is one in this extensive line to meet your specific needs.

70 Years Experience

Westinghouse . . . .
AIR BRAKE CO.
Industrial Division
PITTSBURGH, PA.

Training Programs in Machine Tool Plants Found Satisfactory

Cleveland

• • • **Training learners** for specialized production jobs in the expanding machine tool and aircraft parts industries here holds promise of working out to a more satisfactory degree than expected by some of the executives who were forced to step up their training programs because of the shortage of skilled mechanics.

A check at a few of the principal Cleveland plants shows that Warner & Swasey Co., turret lathe makers, has put on about 400 learners in the last eight months (these are apart from the 60 regular apprentices); while National Acme Co., manufacturer of screw machines, has approximately 350 learners on its rolls, having added around 75 in the last three weeks. Thompson Products Inc., maker of aircraft valves and parts, has adopted the system on a liberal scale. Cleveland Pneumatic Tool Co., another aircraft parts firm, has around 70 youths in training, working up gradually to unassisted operation of machines in around 6 months' time.

Majority of the learners are graduates of technical high schools. They know how to read blueprints and how to use gages and other instruments. They are familiar in a general way with the operation of some of the standard, basic machine tools. Furthermore, they have an objective and are seeking to make good.

F. H. Chapin, president, National Acme Co., pointed out one intelligent youth of about 20 years, who after three weeks as a learner was capable of producing 20 per cent more per day on a certain operation than the company expected out of its experience with older men. This youth, however, is an exception, as usually three to five months are required before the learner can take over operation of a machine without excessive supervision.

When there arises the necessity for quickly increasing employment, the policy of training inexperienced men for the specific job, rather than selecting workmen from the open field of all-around mechanics, has proved the better plan, said Mr. Chapin.

National Acme learners are almost entirely from technical high schools. The company does not attempt to give all-around training, but puts the youths under supervision of foremen who place them upon milling machines, grinders or other specialized jobs. When it is found that a learner's hands or eyes do not adapt him to high precision tasks such as chaser grinding, the youth is assigned to other tasks where he is believed more capable of succeeding.

"Under any conditions, the number of skilled mechanics to be found in the open market is in reverse ratio to the degree of skill required," says Mr. Chapin. "Because of this, and the difficulties that result from attempting to change the established habits of mankind, we find that the technical high school vocationally-trained and otherwise "green" employee will more quickly adapt

himself to today's methods and standards than will the all-around journeyman mechanic.

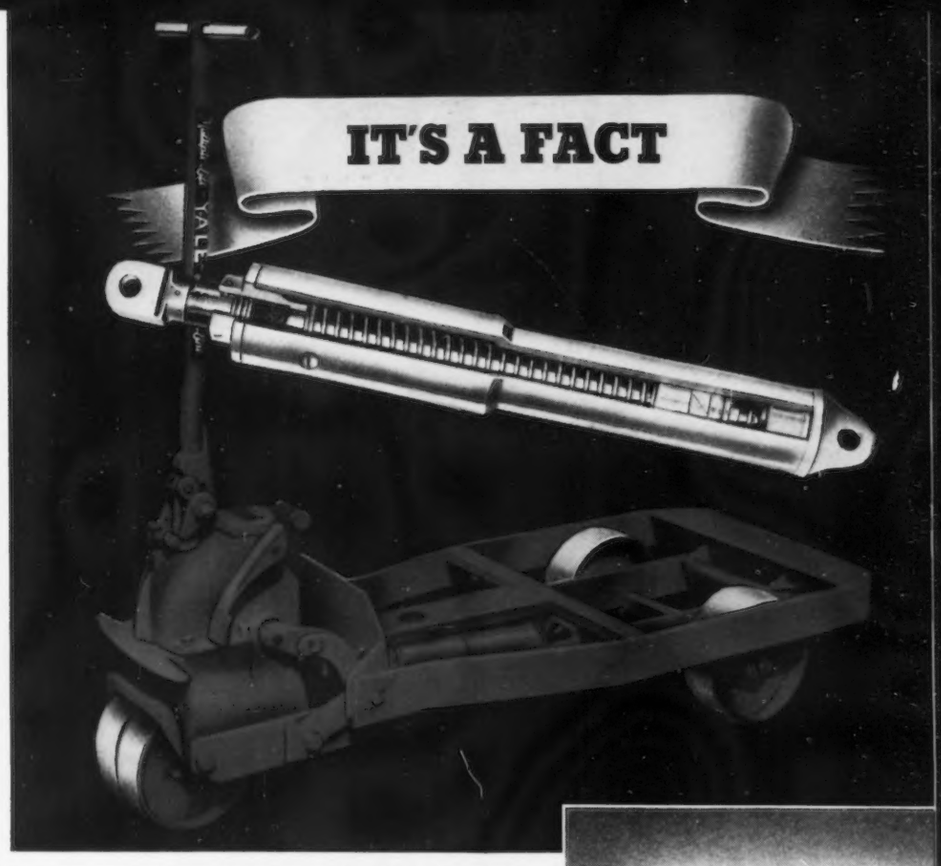
"**Close mechanical** tolerances of high precision machinery involve limits which were unpracticed and unknown a few years ago. For example, some machines used in the processing of tools are set to microscopic standards measuring down to one hundredth of one thousandth of an inch. The primary technical schools are keeping generally abreast of new developments. Their graduates are machine and precision conscious. After four years of study combined with practice in fundamentals, they are likely to fit into the job more quickly than the journeyman mechanic, except though he may be in another class of work. There are, of course, exceptions to be made, and this is written with no thought of deprecating the skill or worth of the employee who has served his time under the apprentice system, for many of these are plant instructors of the novice. We are here considering especially the employer's problems of finding the best means of building skilled men most quickly under conditions when the open market does not afford them.

"A word of high commendation is due the technical high schools for the success they have achieved in developing the higher skills of the machinist trades. To my knowledge, no less than twenty local mechanical plants are being thus served, and from this group alone more machine-conscious young men are sought than are available."

National Acme Co. finds that whereas applications for employment formerly were four to one in favor of white collar jobs, the reverse is true now.

The Warner & Swasey program of training learners is purposely rendered as flexible as possible. Some of the youths start in the "burr file" department where their aptitude with a file is watched closely by foremen long experienced in detecting skill. Others start as "observers," alongside a veteran machine operator. While there is no definite rule, it might be said roughly that the youths with the better high school records start as observers, although this does not necessarily hold true in every case.

Records seem to indicate it is



IT WILL PAY YOU TO CHECK UP ON THIS LATEST HAND LIFT TRUCK

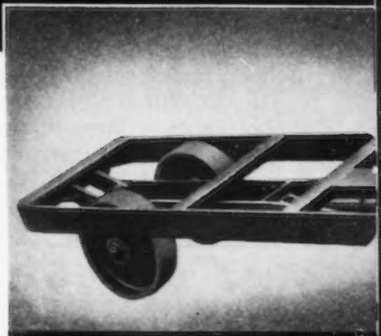
...and here's why

The new *Transliftor*, universal lift, multi-stroke, heavy duty, hand lift truck, incorporates into its design the findings of years of research directed toward better construction and more efficient operation. It will carry heavier loads* at less cost and with less effort. Note these *Transliftor* advances:—

1. **Hydraulic release check** . . . never drops a load. Its cushioning action gradually lowers the load, safeguarding it, the truck, operator and floor.
2. **Telescopic bar frame** . . . gives greater floor clearance. Platform rails are located outside the frame rails for better support.
3. **Selective lift** . . . This lift has a pump action moving in an oil bath for easier operation, and permits either full strokes for quick lifts, or short strokes for heavy loads.
4. **Torsion-type rear link** . . . provides greater stability to the load, acts as a side sway eliminator and reduces wear.

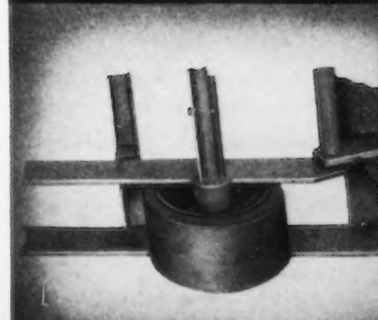
Your Yale representative (he's listed in your classified telephone directory) will be glad to tell you of other *Transliftor* features. Ask him about the universal lift, replaceable bearings, free handle control, and machine faced roller bearing steel wheels. Or write to us direct.

* Capacities 3,500 to 5,000 lbs.



TELESCOPIC BAR FRAM

SELECTIVE LIFT MECHAN



TORSION-TYPE REAR LI

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

YALE

Makers of Yale Hand Chain Hoists, Electric Hoists, Electric Industrial Trucks, Hand Lift Trucks and Skid Platforms.

three to five months before the learners can take over a machine without excessive supervision at Warner & Swasey.

The Weatherhead Co., a Cleveland parts maker, has started an apprentice training plan to prepare general mechanics. Young men chosen for the course are high school graduates, preferably from technical high school. They are given an entrance examination preliminary to a four-year course which includes regular work at fourteen different stations in the plant, with meetings three times a week for training in the theory of the work.

Most of the labor shortage in highly skilled lines exists at present in six factories here, the only plants here now operating under national defense manufacturing conditions. It is estimated that these metal working plants could use 380 skilled workmen today, according to a survey made by the Cleveland Personnel Managers Association. The 380 jobs involve 26 specific types of work. Greatest demands are for hand screw machine men, assemblers for machinery involving fitting; grinders, tool makers, skilled operators of precision machine tools and automatic screw machine operators. The six companies that could use the 380 men at once already employ 10,500 men.

Industry Is Warned of Coal Buying Difficulties

Washington

• • • **T. W. Harris, Jr.** division purchasing agent, E. I. du Pont de Nemours & Co., told a gathering of 400 industrialists and engineers here last Friday that the "difficulties in purchasing coal properly will be materially increased upon the application of minimum prices" by the bituminous coal division of the Department of the Interior. He listed "uncertainties" which will arise under minimum prices as the "prices themselves," "quality," "production" and "uncertainties with regard to service."

Dravo Launches All-Welded Diesel-Propelled Towboat

Pittsburgh

• • • **With Vice-Chairman** Thomas M. Woodward of the United States Maritime Commission making an address on river transportation and national defense, the Dravo Corp., recently launched a new all-welded screw diesel-propelled towboat, the William Penn, at the corporation's Neville Island shipyards on the Ohio River. The boat was constructed for the Union Barge Line Corp., a Dravo affiliate.

This motor ship, one of the largest built for river service, has a hull 170 ft. long, 36 ft. wide, and 10 ft. deep, and is designed to push, stop, steer, and flank large flotillas of barges rigidly fastened to and ahead of her. A product of extended research, it is expected that her performance will introduce new efficiency and economy in river towboat service.

The William Penn is equipped with two eight-cylinder reversing 650 hp. National Superior full-diesel engines and her propulsion is unique in that the propellers are partially inclosed by a special tunnel design and fully encircled by modified Kort nozzles, which features make it possible, it is said, to develop maximum pushing power combined with exceptional maneuverability.

The new tow-boat will operate between Pittsburgh and New Orleans, and under average conditions should steam the Mississippi River with not less than 10,000 tons of freight.

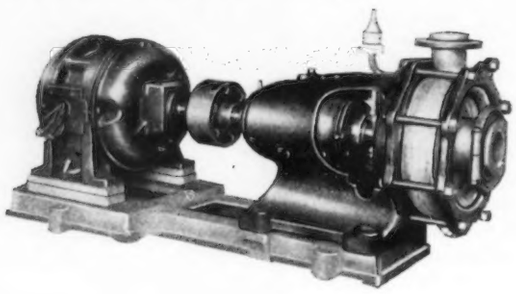
Guests of honor attending the launching included representatives of government and industry from Pennsylvania, Ohio, and West Virginia.

Announcing: A New Line of

Acid Resisting

Centrifugal Pumps

•



Several of the advanced features are:

Bearings, both radial and thrust, are of the ball type and are thoroughly protected from moisture, fumes and dirt.

Leakage at the stuffing box is eliminated by the use of auxiliary ports in impeller.

The impeller is threaded to the shaft—impeller and shroud are leaded and keyed to the shaft.

The Duriron (or Durichlor) protecting shroud is renewable.

Micro-adjustment of impeller is provided by threaded shaft and bearing sleeve.

The streamlined base is rugged and proof against vibration.

Rigidity of the patented clamping yoke increases stability of the base.

These new Pumps (Model 40) are available in Duriron and Durichlor in a range of sizes from 1½" suction—1" discharge to 6" suction—6" discharge.

Write for a copy of Bulletin No. 810-C. It shows the details of construction and the head and capacity ranges of the several sizes.

THE DURIRON COMPANY, Inc., 438 N. Findlay Street, Dayton, Ohio

Correction

IN the article entitled "New Graphitizing Alloy for Ladle Additions," published on page 49, June 6 issue of THE IRON AGE, it was stated that an alloy, SMZ, developed by the Electro Metallurgical Co. was composed essentially of S, Mn and Zr. This should have read Si, Mn and Zr. The principal constituents of this alloy are silicon, manganese and zirconium, not sulphur as was indicated.

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OFFER PRE-ASSEMBLED SHAKEPROOF LOCK WASHERS *and* SCREWS

The Modern Fastener Unit that reduces assembly costs and improves product performance!

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SHAKEPROOF LOCK WASHER COMPA
2511 North Keeler Avenue, Chicago, Illino

THE STEEL COMPANY OF CANADA, LT
Hamilton, Ontario

Politicians Can Block Plans to Arm, ASME Told

Milwaukee

• • • **American industry** can and will quickly supply the Army and Navy with all necessary military and mechanized equipment, if it is freed from political interference and governmental red tape, Warren H. McBryde, president, American Society of Mechanical Engineers, said in his opening address before that organization's semi-annual meeting here last week.

"The efficiency of American industry," Mr. McBryde said, "is best measured by the degree it is let alone." Resources, material, brains and ability to train men are all present here, he added, but an understanding and appreciation of industrial problems must not be lacking.

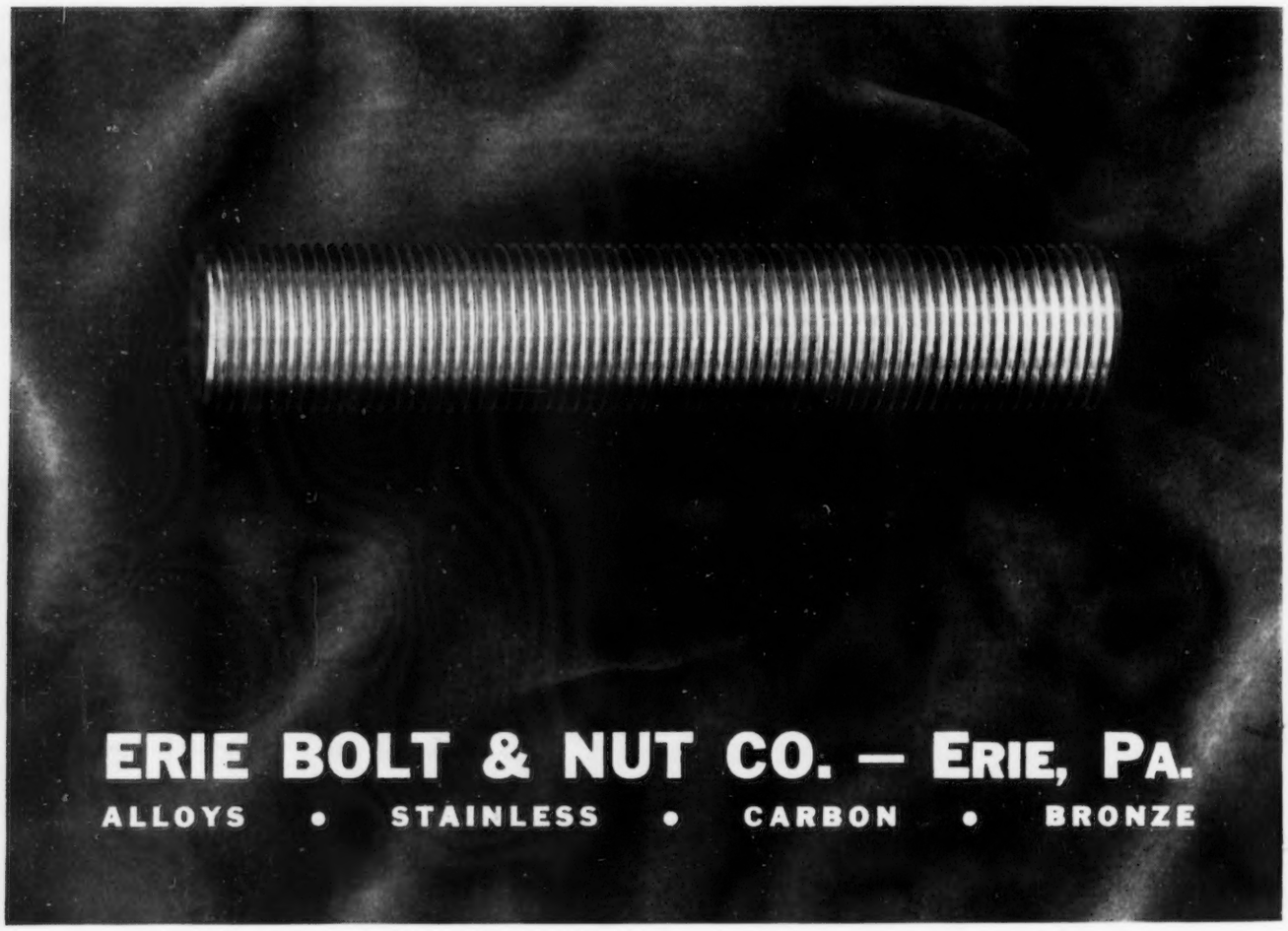
Hanley Nominated For ASME President

NOMINATIONS for the 1940 officers of the American Society of Mechanical Engineers include for president, William A. Hanley, Eli Lilly & Co., Indianapolis, and as vice-presidents, Dean Samuel B. Earle, school of engineering, Clemson Agricultural College, Clemson, S. C., Frank H. Prouty, Prouty Brothers Engineering Co., Denver, and Edward B. Ricketts, Consolidated Edison Co., New York. Election will be held by letter ballot of the membership of 15,000, closing Sept. 24, 1940.

More than 500 engineers from many states registered for this four-day interchange of technical knowledge and visited some of Milwaukee's industrial plants. The technical sessions included separate discussions on hydraulics, power, management, education and training, and machine shop practice.

At the business meeting, President McBryde, who is a San Francisco consulting engineer, announced a three point program by which the association could cooperate in national defense. He proposed first: A national inventory of mechanical engineers whereby their experience and abilities could be recorded for possible use in case of emergency; second, the society's present committee on national defense, consisting of W. C. Dickerman, American Locomotive Co., and Thomas A. Morgan, Sperry Co., both of New York, K. H. Condit, dean of engineering, Princeton University and J. L. Walsh, New York consulting engineer, will be enlarged to an unstated number; and three, the association will pool and exchange information and aid public forums in advising on national policies.

C. E. Davies, national secretary



of the society, declared expert production engineering to be of utmost importance to the Army and Navy, and offered the facilities and personnel of the society for advice and supervision toward that end.

At the first session on machine shop practice, F. O. Volz, Lakeside Bridge & Steel Co., Milwaukee, told how the machine tool industry has made use of electric welded construction for machine bases, columns and other parts without sacrificing the usual high standards of quality. Among the advantages of welded construction, as outlined by Mr. Volz, are no limitation in design or thickness of materials to be used, good appearance, rigidity, high resistance to impact and fatigue, weight economy of from 25 to 35 per cent, and lower cost. Many times the welded part has been made for the estimated cost of the pattern alone. Furthermore, shipment usually can be made within a week to 10 days after completion of the design, he stated.

F. J. Dost, superintendent, Sterling Foundry Co., Wellington, Ohio, said that more progress had been made in the past 10 to 12 years in making high quality machine tool castings than in the previous 20 years as regards both foundry technique and metallurgical requirements. Up to 10 years ago, 25 to 50 per cent high carbon, low silicon steel was used for cast beds, frames and sliding members but where both heavy and light sections were encountered in the same castings, results were not always satisfactory. Nickel was used as a stabilizer with good results. Because of demand for more uniformity, better finish and greater resistance to wear, a high strength type of iron was adopted, with low carbon and high silicon, obtained by using 70 to 95 per cent steel in the cupola charge.

Comparative analyses of the two irons for the same size castings are listed in the following table:

20 to 50% steel		70 to 95% steel
3.25 to 3.50	carbon	2.70 to 3.00
1.10 to 1.25	silicon	1.85 to 2.25
0.60 to 0.70	manganese	0.70 to 0.90
0.10 to 0.30	phosphorus	0.20 max.
0.08 to 0.12	sulphur	0.10 max.
1.00	nickel	1.00 to 2.00
163 to 187	brinell	207 to 269

Marked improvements were shown by the new iron, Mr. Dost said, and all was well except for an occasional case of scoring or galling of wearing surfaces or ways. An investigation was accordingly started which finally included 10,000 chemical determinations and 4000 microscopic examinations over a two-year period.

MAX W. BABB, president, Allis-Chalmers Mfg. Co., is shown here welcoming members of the American Society of Mechanical Engineers at an Allis-Chalmers luncheon. At the left is W. H. McBryde, president, A.S.M.E.; at the right, F. H. Dorner, general chairman, the Milwaukee meeting.

It was finally decided that the presence of primary ferrite was the cause of the scoring and galling. Experiments were then started to eliminate this primary ferrite from the structure or to control its presence. Late ladle additions of amorphous graphite showed a definite improvement in structure. These additions were later supplemented with ferrosilicon and then several combinations of ferrochromium and ferrosilicon were tried. Mr. Dost said data is being developed currently on straight ferrosilicon additions. Control of depth of this formation is possible with available data.

The usual admonition to aspiring engineers to specialize was blasted in a talk by W. H. Carrier, chairman, Carrier Corp., Syracuse, N. Y., when he called for a broad and thorough understanding of fundamentals of engineerings rather than specialized knowledge in the student. Mr. Carrier declared that one underlying error common to technical institutions is their failure to appreciate that the chief objective of a technical education should be to train the student in logical thinking and to develop his creative imagination.

Types of ferrous and non-ferrous materials that can be hard-faced were described by E. E. LeVan, vice-president, Haynes Stellite Co., Kokomo, Ind. Preparation of work, different procedures and actual applications in various industries were discussed by Mr. LeVan.

Francis J. Trecker, assistant chief engineer, Kearney & Trecker Corp., discussed "A New Method of Tool and Die Milling" (*see* THE IRON AGE, *Sept. 14, 1939*), and presented the premiere showing of a sound motion picture in color illustrating the abilities of this recently developed machine.

Experience with metals at high temperatures for power plants was discussed in a paper authored by A. E. White and C. L. Clark, director and research engineer, University of Michigan department of engineering research.

Through courtesy of Allis-Chalmers Mfg. Co., a complimentary luncheon preceded the scheduled plant visits. Kearney & Trecker Corp., threw open for the first time the gates to its brand new plant addition, just completed at a cost of over $1,500,000.

Hispano-Suiza Engine Studied For Possible U. S. Production

Washington

• • • **With the Ford Motor Co.** tooling its River Rouge plant for mass production of the liquid-cooled British Rolls-Royce-Merlin 2000-hp. airplane engine, the government's national defense program tentatively contemplates large output of another foreign liquid-cooled airplane engine, the French Hispano-Suiza. Two of the latest Hispano-Suiza engines are being shipped to the United States. One is said to be a 2000-hp. H-type 24-cylinder motor and the other a 1000-hp. double-row, air-cooled radial engine. As is well-known, consideration is being given to heavy production of a domestic liquid-cooled engine, the Allison, a General Motors unit. Other types of engines also are being studied with a view to mass output. But for the present, concentration seems to be on the liquid-cooled engine. Output of air-cooled engines already has been appreciably increased.

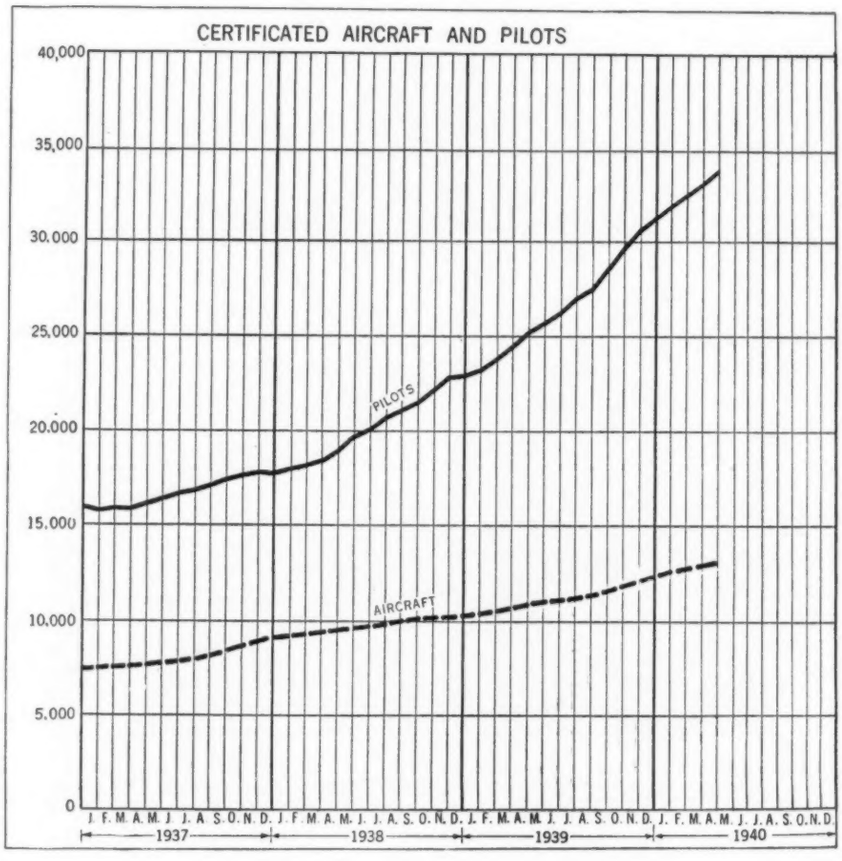
"We ought to have at the disposal of this Government every proven liquid-cooled engine," said Secretary of the Treasury Morgenthau in commenting on France's release of rights for unrestricted manufacture of the Hispano-Suiza in the United States. These engines were secured by the same kind of direct negotiation between governments as was used in getting American rights to the manufacture of the British engine. The plan of the Government is to select one or two types.

The Ford company is said to have been given a contract through W. S. Knudsen of the National Defense Advisory Commission for the production of 9000 Rolls-Royce engines. The reported difference of opinion between Mr. Knudsen and Edsel Ford was cleared up when the company said that the engines were being made at the direction of the United States. Mr. Ford had said the company will make engines for defense purposes only. However, Mr. Knudsen pointed out, the Ford company had assured him that the division of 6000 engines for Great Britain and France and 3000 for the United States would be satisfactory. The quota originally intended for France will go to Great Britain, it is said.

Turning to another phase of national defense the National Advisory Defense Commission has asked for a 25 per cent expansion of the power capacity of the Tennessee Valley Authority. It will cost $65,000,000 and the initial outlay will involve $25,000,000. Plans for the further development of TVA are the result of conferences between Edward R. Stettinius, Jr., of the Commission, in charge of raw materials and David E. Lilienthal, TVA vice-chairman. Participating in the conferences on behalf of the Commission were President Gano Dunn of the J. G. White Engineering Corp. and President Charles V. Kellogg of the Edison Electric Institute, members of Mr. Stettinius' staff. The program calls for the construction of an additional hydro-plant and a steam plant.

The commission said that an immediate increase in power production in the TVA area is "necessitated by national defense demands arising from industrial develop-

THE NUMBER OF AIRPLANE pilots in the United States has increased 128 per cent since the beginning of 1937, according to the Civil Aeronautics Authority. On May 1, 1940, there were 33,740 pilots holding various grades of Civil Aeronautics Authority certificates as compared with 25,050 on May 1, 1939, and 14,805 on Jan. 1, 1937. These figures do not include student pilots among whom are the participants in the CAA civilian pilot training program scheduled for completion by June 30, 1940. This will add more than 9000 new private pilots to those shown on the chart. On May 1, 1940, there were 12,829 aircraft as compared with 10,724 on May 1, 1939, and 9072 on Jan. 1, 1937.



ments in that area, including the Alcoa plant of the Aluminum Co. of America, which is engaged in the production of materials for aircraft manufacture, as well as chemical enterprises in the area, which are being rapidly expanded."

Meanwhile the administration has announced that it will permit the use of private capital to the greatest possible extent for industrial defense expansion. SEC Chairman Jerome N. Frank in a letter to Chairman Francis A. Bonner of the National Association of Securities Dealers said that the commission will do everything in its power to see that no obstacles are placed in the way of raising these funds through normal market channels. At the same time Secretary Morgenthau made a somewhat similar statement while previously Federal Loan Administrator Jesse H. Jones stated that private capital probably could take care of most of the defense requirements for funds.

Without revealing its details Secretary Morgenthau announced that the administration had worked out a formula for capital expansion of defense industries. It was stated that the formula would take care of amortization of specially-built defense plants and that for the present legislation would not be necessary. In this connection it was recalled that Chairman Doughton of the House Committee on Ways and Means recently suggested that excess profits and amortization should be included in the same legislation.

Pointing to an instance in which request might be made for government funds, Secretary Morgenthau spoke of concerns which might be asked to construct plants for the exclusive purpose of war production and which would have no subsequent value.

"I think the government should put up that kind of venture capital and take the risk," said Secretary Morgenthau. "But if a business wants to expand and take a risk, that's a matter for business judgment."

The formula in cases of this kind, Mr. Morgenthau said, would recognize the lack of interest which private capital might have.

German Steel Offers in S.A. Are Confirmed

Washington

• • • **State Department** officials, confirming reports in THE IRON AGE for June 20 that South American countries are being offered German steel for shipment by October, said this week that it is far too early to ascertain definitely how the projected $2,000,000,000 inter-American cartel would affect German-South American trade growing out of Nazi offers to supply steel and other products at rates below American prices.

They said, however, that, while they could not substantiate the report that German steel was being offered with a cash guarantee of delivery, at 10 per cent lower than American prices, they did not consider the development surprising in view of German offers to South American countries under the Nazi forced barter policy. It was said that German plans for a post-war trade revival with South America while perhaps unduly optimistic were not unexpected.

The forecast that administration economic advisers were weighing establishment of an inter-American trading corporation to curb forced barter agreements appeared in THE IRON AGE for June 13 *(see page 58)*. A few days later, following the news that France had sued for peace, the White House directed that four Cabinet members draw up an all-American trade program to counter German economic penetration in the Americas through price concessions, subsidies or other inter-American co-operative devices.

Officials speculated this week that revival of Nazi offers to sell products at bargain prices in exchange for South American commodities might not be curbed even after approval of an inter-American cartel system. It was emphasized that in the absence of more specific details, it is impossible at this time to appraise the extent of benefits likely to flow from the venture.

Also, officials advanced the suggestion that cooperative action on the part of United States exporters might have to be a phase of the economic weapon to make it more completely effective.

As described by President Roosevelt last week, the program envisions "an appropriate inter-American organization for dealing with certain basic problems of their trade relations, including an effective system of joint marketing of the important staple exports of the American republics."

As further described by the President, the projected All-American cartel will require Congressional approval but does not contemplate abandonment of the principles of the administration's reciprocal trade agreement program. There may be a single corporate set-up with all American countries represented and with a separate division for each commodity involved—or there may be separate corporations for each commodity.

Dominion Places Heavy Tax On Automobiles

• • • **Canada's new billion** dollar budget and tax bill, now before the House of Commons, lays heavy taxes on automobiles of both Canadian and American manufacture. Canadian-made motor cars will pay an excise tax and imported cars a duty of 10 per cent on value up to $700; of 20 per cent on values from $700 to $900; of 40 per cent from $900 to $1,200, and of 80 per cent on values above $1,200. The tax becomes effective immediately upon passage of the bill and will be collected on cars in dealers' showrooms and new cars in transit.

The new taxes will make ownership of motor cars except in the lowest price field almost prohibitive. Automobiles now selling for $1,000 will cost $1,150. A $2,000 car will cost $2,870 and a $4,000 car will cost $6,270.

Nearly all high priced cars sold in Canada are made in the United States, while the lower priced cars are made in Canada.

Congress Votes 5 Billions for U. S. Defense, to Vote 4 Billions More

Washington

• • • **As preparations are** being pushed to gear industry to war production, Congress has appropriated some $5,000,000,000 for the national defense program. Recessing last Saturday it will resume its session next Monday, faced with other huge appropriations, including about $4,000,000,000 for a 70 per cent increase in the Navy. This bill already has passed the House. For the Army, Congress enacted a supplemental bill for $1,762,513,908 in direct appropriations and contract authorizations. Of this sum $43,500,000 is for airplane engines for the Army air corps. Other large sums will be appropriated for the War Department which, it is said, contemplates construction of a chain of government munitions plants, reported to have been recommended to the President by the National Defense Advisory Commission.

For the Navy, Congress enacted the $1,492,542,750 Vinson-Walsh bill, the terms of which were outlined in THE IRON AGE of June 6, page 72. Just before retiring as Secretary of the Navy on Monday, Charles Edison, who has announced his candidacy for governor of New Jersey, said that the Navy was ready to release negotiated contracts for 68 ships, costing $750,000,000 as soon as the President signed the bill.

The May-Sheppard Bill was enacted to expedite strengthening of the national defense. In this legislation is a sweeping provision empowering the President to embargo or curtail exports. It is expected that the government will use the authority given it to clamp down particularly on exports of machine tools by curtailing rather than embargoing them. It is certain that no restrictions will be placed on shipments to Great Britain. The embargo provision is so comprehensive that it could be applied to an almost unlimited list of products which might be classified as "munitions," such as steel and scrap.

The Reconstruction Finance Corp. was given added funds and power to make loans. It was authorized to set up corporations for the production of critical materials, the manufacture of munitions and to increase railroad loans up to $500,000,000 to be used for the purchase of rolling stock or other purposes authorized by law.

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8% Profit Permitted on Ship Construction Jobs

• • • **As finally enacted,** the Vinson-Walsh Bill to expedite ship construction increased from 7 to 8 per cent the percentage of profits allowed shipbuilders and airplane manufacturers in the case of contracts made on the basis of competitive bidding. The rate of 7 per cent fixed in the Senate bill on negotiated contracts remains.

The bill carries a provision specifically applying the terms of the Walsh-Healey Act with respect to negotiated as well as competitive bidding contracts. The 40-hr. week, however, may be exceeded where necessary under the exigencies of the situation, time and a half to be paid to per diem workers.

A new provision authorizes the government to take over and operate a plant or facility whenever the President deems that the Navy Department is unable to arrive at an agreement with the owner regarding operations. The Navy could operate the plant or have it operated under contract with a private firm.

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Defense Bill Gives President Broad Powers

• • • **Another defense bill** which was enacted authorizes the Reconstruction Finance Corp., among other things, to create, one or more corporations (a) to produce, acquire and carry strategic and critical materials; (b) to purchase and lease land, purchase, lease and build or expand plants and purchase and produce equipment, supplies and machinery for the manufacture of arms, ammunition and implements of war; (c) to lease such plants to corporations for manufacturing purposes and (d) to engage directly in manufacture of war supplies if the President finds it necessary for the government or any of its agencies to do so. Any corporation formed with the approval of the President could make payments against the purchase price of strategic and critical materials in advance of delivery and where practicable require that these payments be used for raw and manufactured agricultural commodities for export. The legislation would increase to $500,000,000 from $350,000,000 the RFC limitation on railroad loans or commitments.

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President May Embargo Tool, Munitions Exports

• • • **Without indicating** how broadly it will be applied it is reported that the President soon will issue a proclamation under the provision of the May-Sheppard Bill banning or curtailing exports of equipment, munitions, machinery and tools necessary for their manufacture or servicing. The embargo provision will run until June 30, 1942. Violation of the provision is punishable by a fine of as much as $10,000 or imprisonment for not more than two years.

The May-Sheppard Bill provides authorizations for the War Department to expedite the strengthening of the national defense. Like the Vinson-Walsh Bill to expedite shipbuilding, the May-Sheppard measure authorizes negotiated contracts as well as competitive bidding for the construction of plants and military posts; for the manufacture of military equipment, war munitions and supplies. It also sets up an emergency fund appropriating $66,000,000 and authorizing a like amount for the procurement of strategic and critical materials.

Approximately $376,000,000 has already been appropriated to enter at once upon the construction of plants to produce powder,

shells, armor, aircraft and other materiel. It is reported that the Defense Advisory Commission and the War Department have approved sites for some 30 arms plants to be located chiefly in the Middle West and South.

An estimate by the War Department provides for 139 ordnance, chemical, quartermaster and aircraft plants costing about $527,000,000. At present there are only 19 such plants. In addition to existing private plants, it is estimated that 30 airplane frame plants, costing $300,000,000 and three engine plants costing about $60,000,000 are needed to build up capacity for the production of 50,000 airplanes recommended by the administration.

The ordnance plants proposed by the War Department are:

Four smokeless powder plants, to cost $188,000,000; four for TNT, $42,000,000; 18 shell and bomb loading plants, $108,000,000; six for machine guns and airplane cannon $36,000,000; three proving grounds, $28,000,000.

For the Chemical Warfare Service, one new arsenal to cost $26,500,000 and 26 commercial plants costing $9,000,000 were recommended.

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• • • **A House-approved** $4,000,000,000 bill authorizes an underage tonnage of combatant ships of 1,325,000,000 tons or about 200 ships and several hundred submarines. Keels cannot be laid immediately but new facilities are expected to be developed under the bill. Under this bill the Navy would be expanded by about 70 per cent, as recommended by Admiral Stark, chief of naval operations.

It authorizes the appropriation of not more than $150,000,000 for essential equipment and facilities at either private or naval establishments and not more than $25,000,000 for 100,000 tons of auxiliary vessels and patrol craft. It eliminates the 1934 requirement that 10 per cent of naval aircraft be produced in government plants and authorizes an appropriation of $15,000,000 to permit the Secretary of the Navy to expand facilities at the Navy's only gun factory in Washington, D. C., and to construct additional gun plants west of the Allegheny Mountains.

Members of the House Naval Affairs Committee frankly concede that a serious bottleneck exists in armor plate facilities but hope that through the further development of the Charleston, W. Va., plant to reduce the four to five years required heretofore to construct a battleship.

Mobilize Industry, Gen. Johnson Urges

CHICAGO—In an address before more than 1000 delegates to the 36th annual convention of the Advertising Federation of America, which is meeting here this week, Gen. Hugh S. Johnson, former NRA administrator, declared that "industry is war and war is industry" and urged "mobilization of our wealth and industry as well as men."

FTC to Hold Resistance Welder Hearing July 12

Washington

• • • **The Federal Trade** Commission has set July 12 as the date for hearings on proposed trade practice rules for the resistance welder manufacturing industry. The commission estimates the sales volume of resistance machines, their parts and equipment at approximately $6,000,000 annually. A conference on the trade practice rules was held in Chicago on April 30.

Bethlehem Shipbuilding Plans $500,000 Program

Baltimore

• • • **City officials here** have signed an ordinance giving Bethlehem Steel Co.'s shipbuilding division the right to make improvements on a four acre tract of land along the Key highway.

While no final conclusions have been reached by the company, a program may be adopted for building of a new pier, extension of an existing pier, expansion of shop facilities and construction of a wet basin. Total cost of the improvement is estimated at $500,000.

Bethlehem Steel plans to build a new chemical and physical laboratory at the Maryland plant, Sparrows Point, Md., at an estimated cost of $75,000.

Bethlehem Steel plans to add one way at its Union plant, San Francisco. Plans call also for resumption of shipbuilding at the Alameda, Cal., shipyard. The latter plant has been active for ship repairs only. Reports from Seattle indicate that similar rehabilitation is planned by Todd Drydocks, Inc.

Curtiss Propeller Will Double Output By Sept. 30

• • • **Early in July** the Curtiss-Wright Corp. will begin construction of a new plant at Caldwell, N. J., which when completed by the end of September will double the manufacturing facilities of the Curtiss Propeller division. About a year ago the propeller division was moved from Buffalo to Clifton, N. J. This plant will remain in operation.

Bullard Gives Contract For Shop Extension

• • • **The second expansion** move this month by the Bullard Co., Bridgeport, Conn., machine tool manufacturer, came this week in an announcement that a contract had been awarded to the Turner Construction Co. for the erection of a new one-story and monitor machine shop measuring 175 x 100 ft. The new building, of steel, brick and glass construction, will feature a 60-ft. clear span and a 40-ft. craneway. Plans have been prepared by A. D. Crosett, engineer. Completion is scheduled in less than three months.

Troy Furnace May Melt for Republic

• • • **Republic Steel Corp.** is working out an arrangement with the Hudson Valley Fuel Corp. for operation of the Troy Furnace Corp.'s blast furnace at Troy, N. Y. This will give Republic smelting facilities close at hand for the ores obtained from their various New York properties.

Metallurgists Enlist In Defense Program

Cleveland

• • • **Metallurgists the country** over have enlisted in the Government's national defense program, following a telegraphed offer of cooperation to E. R. Stettinius, Jr., chairman of President Roosevelt's recently appointed advisory commission to the Council of National Defense, from James P. Gill, president of American Society for Metals, with headquarters here.

Mr. Gill said that preparedness plans in Washington affect very seriously the normal operations of the metallurgist.

"Converting industry for making war materials calls for the best in metallurgical knowledge," he said. "Because metals are the basic materials in munitions manufacture and production must conform to precision specifications, the very finest technical brains must be enlisted in the program."

Pickets Are Arrested at Young Radiator Co. Plant

Racine, Wis.

• • • **At the plant** of the Young Radiator Co. here, where a strike has been in progress for three weeks, seven pickets were arrested this week after a disturbance involving their group and police. The fracas took place when company foremen attempted to enter the plant through picket lines. The union is demanding a week's vacation with pay, the right to review cases involving discipline or discharge, revised seniority provisions, and the privilege to consult with management when work is being assigned to other plants.

Defense Group Favors In-Service Training

Washington

• • • **The National Defense** Advisory Commission reported last week that prompt development of highly trained skilled workers for industry can best be accomplished through an in-service training program operating within industry itself.

Making public the rough details of a program under which workers already employed will be advanced through job training and related vocational courses, Sidney Hillman, labor representative on the defense commission, said that the system will be developed with the cooperation of trade and technical schools, drawing instructors in part from their staffs.

The educational effort is expected to great facilitate employment in the industries involved in the industrial defense. The few plants which are understood to maintain organized training programs actually are said to train relatively small numbers of employees.

Production, Machine Tool Exhibit Opens

Cleveland

• • • **The Production and Machine Tool Show,** featuring the latest developments in metal-working machinery, materials and methods, began in Public Auditorium here Tuesday, June 25, with admission by registration.

Richard Bonner, associated with Grob Brothers, Grafton, Wis., who is manager of the show, stated that opening day attendance was satisfactory. The exhibition is open from 9 a.m. to 5 p.m., on all five days.

Exhibitors include: Blank & Buxton Machinery Co., Jackson, Mich.; Cassels Engineering & Machine Co., Wauwatosa, Wis.; Clark Tructractor, Battle Creek, Mich.; C. C. Craley Co., Shillington, Pa.; Delta Mfg. Co., Milwaukee; Doelger & Kirsten, Inc., Milwaukee, Dumore Co., Racine, Wis.; Eastern Cutter & Salvage Co., Newark, N. J.; Fulton Foundry & Machine Co., Cleveland; Grob Brothers; Hamilton Mfg. Co., Two Rivers, Wis.; Mall Tool Co., Chicago, Master Tool Co., Cleveland; Parker-Kalon Corp., New York; Porter-Cable Machine Co., Syracuse, N. Y.; A. Schrader's Son, Brooklyn; Smith Power Transmission Co., Cleveland; Sunnen Products Co., St. Louis; Wells Mfg. Co., Three Rivers, Mich.; Weatherhead Co., Cleveland; Ford Motor Co., Dearborn, Mich.; Jackson Machine & Tool Co., Jackson, Mich., and The V. & O. Press Co., Hudson, N. Y.

Dominion Places More Large War Contracts

Ottawa

• • • **The Canadian government** during the past week placed many large contracts for war equipment. Among these are: Fairchild Aircraft, Ltd., Montreal, $8,310,716; Canada Steamships, Ltd., Montreal, $7,426,080; Canadian Vickers, Ltd., $4,832,039; Ford Motor Co. of Canada, Ltd., Windsor, Ont., upward of $10,000,000; General Motors Products of Canada, Ltd., Oshawa, Ont., upwards of $10,000,000; Marine Industries, $4,000,000; Noorduyn Aviation Co., Ltd., Montreal, $3,441,475; Fleet Aircraft, Ltd., Fort Erie, Ont., $3,323,872; DeHaviland Aircraft Co., Ltd., Toronto, $2,082,866; St. John Dry Docks, Ltd., St. John, N. S., $1,770,645.

Canadian Steel Output In May at Record Level

• • • **Production of steel** ingots and castings in Canada was at virtual capacity in May. Output for the month, 174,417 tons, was the highest on record and was equal to 98 per cent of capacity. Output in April was 153,451 tons and in May, 1939, 121,413 tons.

Pig iron production in May was 93,254 tons, as compared with 84,210 tons in the preceding month and 57,746 tons in May, a year ago. Ferroalloy production in May totaled 10,272 tons, down 28 per cent from the April total, but more than double the output of May, 1939. Production of pig iron and ferroalloys in May was equal to 77 per cent of capacity.

Seven blast furnaces, out of 10 available, were in blast at the end of May.

Hudson Production Of 1941 Cars Begins

Detroit

• • • **An early showing** of Hudson Motor Car Co. cars is anticipated since Hudson has already wound up production on 1940 models and is getting started on the 1941 run. It is reported that cars will be available July 15, although it is not known whether the quantities will be great enough to make public announcement of the cars then.

Personals

Change is inevitable in progressive Industry. Change is constant.

• **F. D. Latshaw** has been named plant superintendent of the Gary Screw & Bolt Works, Gary, Ind., succeeding **William E. Irvin,** superintendent since 1916, who retired June 1 because of ill health. **R. P. McDonald** was appointed to the newly created post of plant manager and will continue as secretary of the company. Mr. Latshaw has been assistant superintendent of the works for about 15 years and an employee of the plant for nearly 25 years. Mr. McDonald has been identified with the Gary plant since 1925, going there from the Pittsburgh Screw & Bolt Corp., parent company works in Pittsburgh.

• **Raymond Knight** has been placed in charge of the Gary screw machine shop and tool room as successor to the late A. J. Windle who had been master mechanic since 1913. The title of master mechanic has been discontinued. **Arthur B. Carroll,** formerly a departmental superintendent, has been made assistant superintendent in charge of production and equipment to succeed F. D. Latshaw.

• **Martin J. Conway,** who has been fuel engineer for Lukens Steel Co., Coatesville, Pa., since August, 1926, has been transferred to the sales department of the company as special engineer for the petroleum industry. He came to this country in 1920 from England, where he had been in charge of tar distillation and by-products operation at the Blaenavon Iron & Coal Co., Ltd. His first job in this country was as fuel engineer for the Pittsburgh Crucible Steel Co., Midland, Pa., from which he resigned in 1923 to join the Steubenville, Ohio, plant of Wheeling Steel Corp., in a similar capacity. He became identified with Lukens Steel in 1926. Mr. Conway was graduated from Oxford University in 1914 with degrees in mechanical and chemical engineering.

MARTIN J. CONWAY, of Lukens Steel Co., who has been named special engineer for the petroleum industry.

• **W. J. Buechling** has been made chief metallurgist at the new plant at Warren, Ohio, of the Copperweld Steel Co., Glassport, Pa. He was graduated from Carnegie Institute of Technology in 1926 with a degree in metallurgical engineering. Mr. Buechling was previously identified with Central Alloy Steel Corp. and later with Republic Steel Corp.

• **Robert Urquhart,** employed at the Homestead steel works of Carnegie-Illinois Steel Corp. since 1914, has been appointed assistant general superintendent in charge of operations. **Walter F. Nicoden** succeeds Mr. Urquhart as superintendent of open hearth departments, and **Robert O. Thomas,** formerly assistant to chief inspector, has been named chief metallurgist. **A. B. Steigerwalt** has been made superintendent of production shops, and **Myron W. Lewis,** plant industrial engineer. **W. C. Hogg** is the new assistant superintendent, open hearth departments, and **A. L. Adams** is superintendent of open hearths No. 1 and No. 2 and foundry.

• **Delbert E. Jack** has been appointed general sales manager of the Duriron Co., Inc., Dayton, to succeed **W. H. Scott,** who is retiring. Since graduating from the University of Colorado in 1923, Mr. Jack has been identified with the design and application of chemical plant equipment and handled Duriron Co. sales in the San Francisco area.

• **T. E. Cook** has been made sales representative in the Chicago district, with headquarters at 1742 Carroll Avenue, by the Jessop Steel Co., Washington, Pa. **J. W. Stranahan** has been appointed to the Cleveland district, with offices at 1210 East 55th Street, and **C. E. Spragg,** formerly in the New York office of the company, has been transferred to the Boston district headquarters at 626 Capitol Avenue, Hartford, Conn.

• **Lincoln T. Work,** associate professor of chemical engineering at Columbia University, New York, has been appointed director of research of the Metal & Thermit Corp., New York. Effective July 1, all of the corporation's research and development activities, including work in electric arc and Thermit welding, pigments, metals and alloys and various phases of chemical and metallurgical engi-

LINCOLN T. WORK, director of research for the Metal & Thermit Corp.

neering will be under his supervision. Dr. Work received his Ph.D. from Columbia in 1929 and has been successively instructor, assistant and associate professor of chemical engineering.

• **James H. Critchett,** vice-president of Electro Metallurgical Co., vice-president of Union Carbide & Carbon Research Laboratories, Inc., New York, and former president of the American Electrochemical Society, has been appointed a member of the National Research Council. Mr. Critchett will serve on the division of chemistry and chemical technology.

• **Earl L. Coleman** has been elected president of the Purchasing Agents Association of Detroit and will take over the duties of president at the September meeting. Mr. Coleman is purchasing agent of the City of Dearborn. **Paul T. Farrell,** Great Lakes Steel Corp., has been elected first vice-president; **C. I. Renwick,** of Bruce Products Corp., second vice-president; and **Roy M. Parkin,** of the Chas. A. Strelinger Co., treasurer.

• **A. H. Kruger** has rejoined the R-S Products Corp., Philadelphia, as sales manager of the industrial furnace division after an association of about seven years with the industrial furnace division of the Philadelphia Drying Machinery Co.

• **Fred W. Pennington**, of the Westinghouse Air Brake Co., Wilmerding, Pa., has been elected president of the Pittsburgh Advertising Club. **Einar Rygg,** of Gulf Oil Corp., is first vice-president; **C. R. Moffatt,** United States Steel Corp., is second vice-president, and **J. A. Cullison,** National Fireproofing Corp., is secretary.

• **C. C. Dewitt** of the Michigan College of Mining and Technology, Houghton, Mich., head of the chemical engineering department of that school is leaving to head a similar department at Michigan State College, Lansing.

• **Robert Hamilton,** of the Dumore Co., Racine, Wis., has been elected president of the Milwaukee Association of Industrial Advertisers. Other new officers are: Vice-president, **E. T. Slackford,** Harnischfeger Corp., Milwaukee; secretary and treasurer, **L. H. Billings,** Falk Corp., Milwaukee, and new director, **Forrest Nelson,** MacWhyte Co., Kenosha.

Obituary

• **Walter C. Doering,** vice-president of American Steel Foundries Co., died in a hospital at St. Louis on June 20, following an illness of 10 days. He was 54 years old.

Mr. Doering, who divided his time between St. Louis and Chicago, was born in Belleville, Ill. He began his business career with the old St. Louis Car Wheel Co. about 1900. Then in succession he was vice-president of the Southern Wheel Co. and of the Bradford Corp., Chicago, before joining American Steel Foundries Co. as vice-president in 1930.

Active in business, civic and club affairs, he was a former president of the Associated Industries of Missouri and a member of the Engineers' Club, American Society of Mechanical Engineers, Army Ordnance Association, and Railway Business Association.

Harry W. Fitts, structural engineer, died suddenly June 20 at Nashua, N. H. Mr. Fitts was born in Lowell, Mass., Sept. 8, 1876. He was graduated from Dartmouth College, Thayer School of Engineering, in 1903. Recently he was New England representative of the Lackawanna Steel Construction Co., with headquarters at Boston. Formerly he was vice-president of the New England Structural Co., Everett, Mass.

• **Dudley Willcox**, assistant general manager and treasurer of the Ajax Electrothermic Corp., Trenton, N. J., died at a Princeton, N. J., hospital on June 14 after an operation for appendicitis. After his graduation from Yale University in 1908, he joined the Tabor Mfg. Co., with which he was associated until 1914. During the next two years he took post graduate work at Princeton, where he met Dr. Edwin Northrup. With him and others Mr. Willcox formed the Pyroelectric Instrument Co., of which he was treasurer. Later when that company was succeeded by the Ajax Electrothermic Corp. in 1920, he became first secretary and sales manager and then treasurer and assistant general manager. In addition to local civic activities, Mr. Willcox was a member of the American Institute of Mining and Metallurgical Engineers and of the Franklin Institute. He was 54 years old.

THE LATE DUDLEY WILLCOX, assistant general manager and treasurer of the Ajax Electrothermic Corp.

• **George Edward Nyman,** a member of the engineering department of Gary works of Carnegie-Illinois Steel Corp., died last week in Gary, aged 41 years. Mr. Nyman suffered a head injury in an automobile accident six weeks ago which apparently was the cause of his death. He had lived in Gary since 1926, going there from Pittsburgh to become a designing engineer for the former Illinois Steel Co. A former student of Carnegie Institute of Technology, he began his career with the Steel Corporation in Pittsburgh about 1922. Regarded as a highly talented engineer of design, he was also well known among Indiana artists, having exhibited oils and water colors in Chicago many times.

Metal Working Activity

. . . Latest Data Assembled by The Iron Age

From Recognized Sources. In Net Tons.

	May 1940	April 1940	April 1939	4 Months 1940	4 Months 1939
Steel Ingots:					
Monthly output[a]	4,841,403	3,974,706	3,352,774	18,303,811	14,139,679
Average weekly output[a]	1,092,867	926,505	781,532	1,058,636	824,471
Per cent of capacity[a]	72.00	61.04	51.11	69.75	53.91
Pig Iron:					
Monthly output[b]	3,513,683	3,137,019	2,302,918	13,751,020	9,728,770
Raw Materials:					
Coke output[c]	.....	4,086,747	2,934,560	17,464,005	13,034,807
Lake ore consumption[d]	5,114,144	4,407,035	3,135,741	19,660,219	13,323,191
Scrap consumption[r]	3,755,360	3,083,000	2,595,000	14,016,000	10,930,242
Castings:					
Malleable, orders[e]	.....	35,290	29,183	146,359	136,519
Steel, orders[e]	.....	34,388	34,388	161,999	150,722
Finished Steel:					
Trackwork shipments[a]	.....	.....	6,819	.....	20,459
Fabricated shape orders[f]	117,789	67,104	118,309	372,398	397,805
Fabricated plate orders[e]	.....	36,213	35,844	131,276	109,042
U. S. Steel Corp. shipments[g]	1,084,057	907,904	771,752	3,994,657	3,235,153
Fabricated Products:					
Automobile production[h]	391,215	432,746	337,375	1,692,677	1,354,709
Steel furniture shipments[e]	.....	$2,008,428	$1,619,218	$8,960,330	$7,165,228
Steel boiler orders[e] (sq. ft.)	.....	878,259	764,996	2,731,490	3,329,637
Locomotives ordered[i]	20	50	19	136	93
Freight cars ordered[i]	2,081	1,812	2,695	4,259	5,702
Machine tool index[j]	92.5	93.4	61.2	93.2†	58.7†
Foundry equipment index[k]	.....	192.9	146.0	305.3†	142.8†
Gear sales index[s]	133	128	88	125†	95†
Non-Ferrous Metals: (U. S.)					
Lead shipments[l]	.....	46,563	37,903	171,967	153,384
Lead stocks[l]	.....	63,463	123,394	.....	.....
Zinc shipments[m]	59,177	46,978	40,641	287,533	168,399
Zinc stocks[m]	75,036	81,234	130,380	.....	.....
Tin deliveries[n] (gross tons)	7,905	7,855	5,980	19,170	33,479
Refined copper deliveries[o]	69,467	68,665	42,484	287,684	192,613
Refined copper stocks[o]	178,664	169,120	332,513	.....	.....
Exports:					
Total iron and steel[p]	.....	612,906	394,008	2,531,708	1,781,618
Rolled and finished steel[p]	.....	270,330	134,478	1,208,344	150,615
Semi-finished steel[p]	.....	96,609	8,849	362,820	9,911
Scrap[p]	.....	221,152	241,780	850,253	1,115,578
Imports:					
Total iron and steel[p]	.....	6,674	49,373	26,784	116,265
Pig iron[p]	.....	286	3,933	4,815	8,359
Rolled and finished steel[p]	.....	32,587	36,497	8,379	75,453

†Three months' average. *Not available.

Source of data: [a]American Iron and Steel Institute; [b]The Iron Age; [c]Bureau of Mines; [d]Lake Superior Iron Ore Association; [e]Bureau of the Census; [f]American Institute of Steel Construction; [g]United States Steel Corp.; [h]Preliminary estimates by The Iron Age—Final figures from Bureau of the Census, U. S. only; [i]*Railway Age;* [j]National Machine Tool Builders Association; [k]Foundry Equipment Manufacturers Association; [l]American Bureau of Metal Statistics; [m]American Zinc Institute; [n]New York Commodity Exchange; [o]Copper Institute; [p]Department of Commerce; [r]Institute of Scrap Iron and Steel; [s]American Gear Manufacturers Association.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	June 25, 1940	June 18, 1940	May 28, 1940	June 27, 1939
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.00
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.00
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.45
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	1.92
Skelp (grvd.)	1.90	1.90	1.90	1.90

	June 25, 1940	June 18, 1940	May 28, 1940	June 27, 1939
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$24.84	$24.84	$24.84	$22.84
No. 2, Valley furnace	23.00	23.00	23.00	21.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	21.06
No. 2, Birmingham	19.38	19.38	19.38	17.38
No. 2, foundry, Chicago†	23.00	23.00	23.00	21.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	22.34
Basic, Valley furnace	22.50	22.50	22.50	20.50
Malleable, Chicago†	23.00	23.00	23.00	21.00
Malleable, Valley	23.00	23.00	23.00	21.00
L. S. charcoal, Chicago	30.34	30.34	30.34	28.34
Ferromanganese‡	100.00	100.00	100.00	80.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melting steel, P'gh.	*$20.25*	$20.75	$18.75	$15.25
Heavy melting steel, Phila.	*20.00*	20.25	18.50	15.50
Heavy melting steel, Ch'go	*18.50*	18.75	17.25	13.50
Carwheels, Chicago	19.00	19.00	18.75	12.75
Carwheels, Philadelphia	22.75	22.75	20.75	16.00
No. 1 cast, Pittsburgh	20.75	20.75	19.25	15.25
No. 1 cast, Philadelphia	22.25	22.25	20.75	16.25
No. 1 cast, Ch'go (net ton)	17.25	17.25	16.75	12.25
Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$4.00	$4.00	$4.00	$3.75
Foundry coke, prompt	5.25	5.25	5.25	4.75
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro, Conn.*	11.50	11.50	11.50	10.00
Copper, Lake, New York	11.50	11.50	11.50	10.00
Tin (Straits), New York	52.25	52.50	53.50	49.00
Zinc, East St. Louis	6.25	6.25	6.00	4.50
Lead, St. Louis	4.85	4.85	4.85	4.70
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	14.00

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 107 to 116. On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices . . .

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 25, 1940	2.261c. a Lb.	$22.61 a Gross Ton	$19.58 a Gross Ton
One week ago	2.261c. a Lb.	$22.61 a Gross Ton	$19.92 a Gross Ton
One month ago	2.261c. a Lb.	$22.61 a Gross Ton	$18.17 a Gross Ton
One year ago	2.236c. a Lb.	$20.61 a Gross Ton	$14.71 a Gross Ton

	FINISHED STEEL High	FINISHED STEEL Low	PIG IRON High	PIG IRON Low	SCRAP STEEL High	SCRAP STEEL Low
1940	2.261c., Jan. 2	2.211c., Apr. 16			$19.92, June 18	$16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	$22.61, Sept. 19	$20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• Enormous program for national defense not yet reflected except in minor degree in steel orders and operations . . . Backlogs of steel companies now heavy in some products . . . Scrap declines in several centers from 25c. to $1.50

ALTHOUGH the steel industry is estimated to be operating at 88 per cent, a point above last week, with near-capacity production in some finishing departments, this is without benefit of the enormously increased iron and steel requirements which will eventually flow from the national defense program.

Notwithstanding the breakneck speed with which huge defense appropriations have been rushed through Congress, only a very small portion of the steel industry's recent orders has come as a result of this program.

It is not yet definitely known in Washington what demands will be made on the iron and steel industry, but surveys are under way by the National Defense Commission to determine actual tonnages involved in prospective requirements. That they will be extremely large goes without saying, but a sufficient supply of steel seems to be assured except perhaps in some categories such as heavy armor plate for Navy ships and light armor plate for Army tanks, but steps are already being taken to increase capacity for production of such items.

There is no evidence as yet in Washington of official intention to fix prices on steel or other commodities, nor will allocations or priorities be resorted to in all probability until occasion arises. Rather than attempt price control, it seems likely that the Government will, if necessary, increase taxes on profits.

The five billion dollars already appropriated for the defense program will probably be increased by an additional four billion dollars for a 70 per cent Naval expansion, which will provide for construction of about 200 surface ships and several hundred submarines. Shipbuilding companies are now planning for additional ways. For the construction of munitions plants, $376,000,000 has been provided. The War Department estimates a need for 139 plants for manufacture of ordnance, powder, shells, armor plate, aircraft and other munitions.

TO conserve supplies of essential materials and equipment, Congress has passed the May-Sheppard bill, giving power to the President to embargo or curtail exports. So comprehensive is the bill that it can be applied to anything deemed to be necessary for national defense. The President is expected to issue a proclamation shortly embargoing certain commodities and equipment.

A defense measure that is moving rapidly is rehabilitation of railroad equipment. Although the Association of American Railroads declares that the carriers are in good condition to handle all traffic demands, individual roads are coming into the market. It is estimated that 50,000 to 60,000 cars may be purchased within the next few months. The largest current program is one of $20,000,000 for the Southern Pacific involving about 2150 freight cars, 120 passenger cars and 25 locomotives. The Nickel Plate has ordered 875 cars and in conjunction with its affiliate, the Chesapeake & Ohio, has bought 46,000 tons of rails for fall delivery.

Although work was suspended last week on French steel orders, there was little effect on steel plant schedules because of heavy backlogs. The British have in some instances agreed to take over French steel thus far produced, while negotiations are still in progress with respect to that ordered but not yet processed.

STEEL orders received by the mills during June have ranged from about 25 per cent more to double those of May, depending upon the product. With the exception of tubular goods, in which there has been only moderate improvement, all products have been in heavier demand. A substantial part of current backlogs consist of sheets and strip, on which the deadline for specifications was recently extended to June 30 and the deadline for shipments to July 31. However, backlogs are especially heavy in semi-finished steel, plates, bars, alloy steels and all special quality steels.

Export tonnage, while still quite heavy from the British, is in much smaller volume from neutral countries than in the earlier months of the year. The report published in THE IRON AGE a week ago that German steel is being offered in South American countries at below American prices is a fact that is being given consideration by the State Department in its advocacy of an Inter-American Trading Cartel aimed to compete with the Nazi forced barter policy.

OTHER than the falling off in export trade from neutrals, the only note of hesitation thus far clearly observable is a decline in scrap prices, ranging from 25c. a ton at Chicago and Philadelphia, 50c. at Pittsburgh, to $1 at Cleveland and $1.50 at Youngstown and Detroit. THE IRON AGE composite scrap price has declined 34c. to $19.58, the first drop since the second week of April.

The first iron or steel price advance in some time is on pig iron at Provo, Utah, amounting to $1 a ton.

The Industrial Pace . . .

WHILE STILL ANOTHER increase in the production and distribution of heavy goods was indicated in the past week by THE IRON AGE capital goods index, the week's gain was the smallest recorded since the present upswing began.

The index, at the close of the past week, stood at 86.1, as compared with 84.8 in the preceding period. While the present index position is still about 14 points below the current year's high of 100 recorded in the second week of January, it is 21 per cent above the 1940 low of 71 established just two months ago.

The first tangible contribution of the new national defense program to increased industrial activity, outside of airplane and battleship construction, is the awarding of several large contracts for the construction of air bases, munition dumps, etc., announced in the past week. The largest award of this type was for the $23,000,000 naval air base at Corpus Christi, Tex.

These heavy defense awards boosted the total of the week's heavy construction projects contracted for to $96,286,000, a new high for 1940.

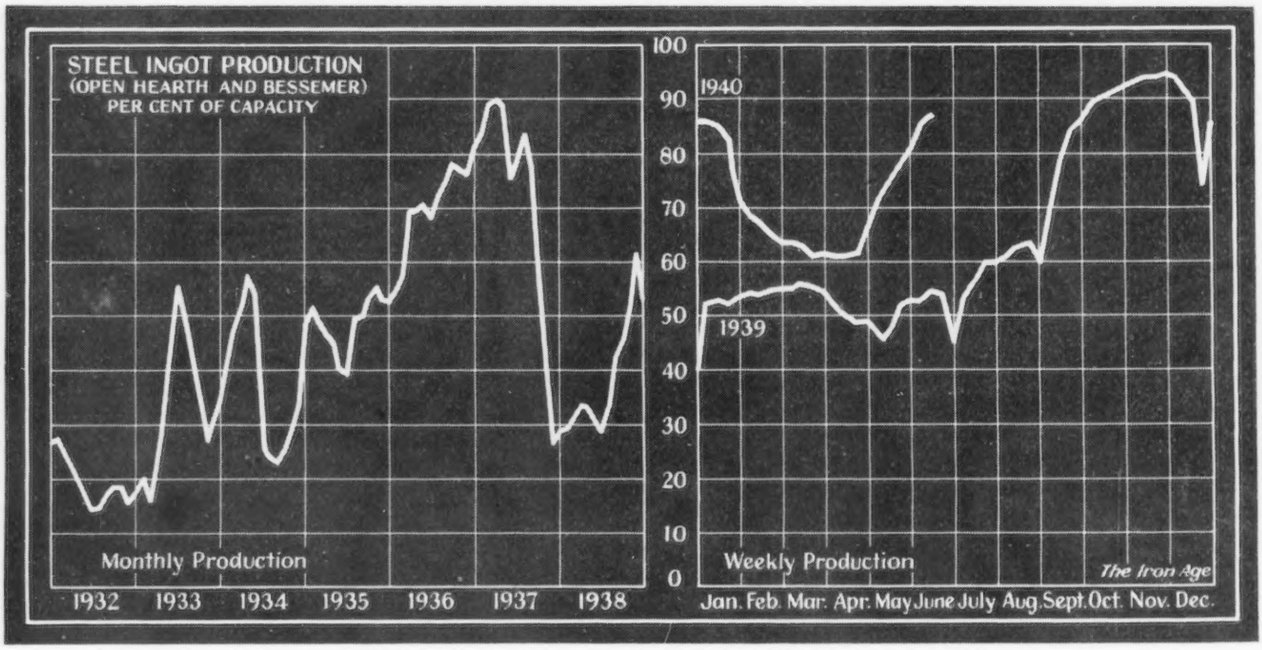
This instance will likely be one of the very few where the effect of the national defense program can be readily detected. Generally the influence of the program will not lend itself to isolation. In many cases the production of defense requirements will go forward alongside of usual peace-time needs. Regardless of the outcome of the European war, it is becoming increasingly obvious that the impetus of the American rearmament program will sustain a high rate of industrial operations here for some time to come.

As has been the case in recent weeks, the construction and steel series were the heaviest contributors to the week's rise in the combined index. The Pittsburgh component was fractionally higher, while automobile production dropped off more than seasonally and lumber carloadings remained unchanged.

The steady rise in freight carloadings since early April continues and strengthens the belief that a new equipment buying program will be undertaken shortly by the nation's railroads. If rail shipments in the next two weeks of June are as heavy as in the past three, the month's carloadings will set the new high for the present year (see accompanying graph). Any new rolling stock buying undertaken by the roads will be predicated not so much on a car shortage as desire to obtain full advantage of economies offered by modern equipment building technique.

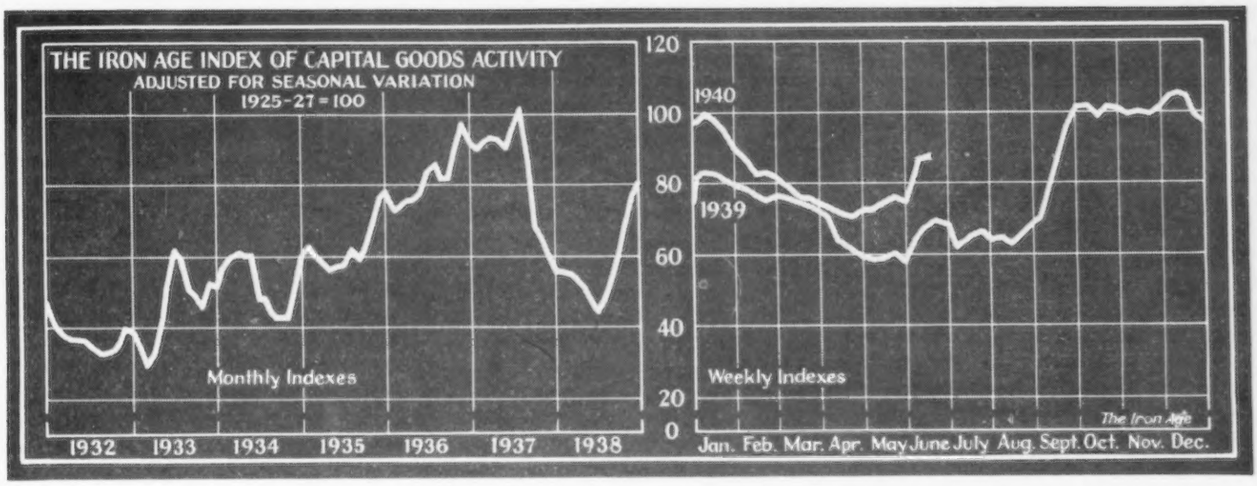
Despite the sharp rise in general industrial operations over the past two months, the cost of metals and metal products has remained practically unchanged. As the accompanying graph indicates, the present level of prices is actually below March and April, although a rising tendency has been in evidence over the past few weeks. This rising tendency has been extremely mild. Such increases as have developed have been due largely to such factors as non-ferrous metals, concrete reinforcing bars and scrap iron and steel.

Steel Output Rises a Point to 88% of Capacity



District Ingot Production, Per Cent of Capacity		Pittsburgh	Chicago	Valleys	Philadelphia	Cleveland	Buffalo	Wheeling	Detroit	Southern	S. Ohio River	Western	St. Louis	Eastern	Aggregate
	Current Week	83.0	92.0	88.0	86.0	85.0	100.0	99.0	95.5	92.0	97.5	71.0	76.5	75.0	**88.0**
	Previous Week	82.0	93.0	82.0	85.0	82.0	100.0	99.0	95.5	92.0	87.5	71.0	73.5	50.0	**87.0**

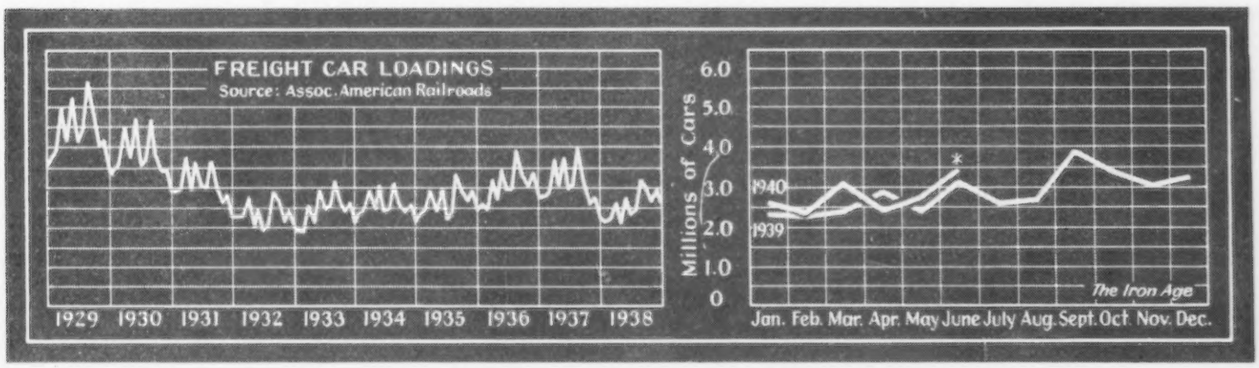
Steel and Building Series Gains Cause Index to Rise



Components ▼ Week Ended ➤	June 22	June 15	May 25	June 24 1939	June 22 1929
Steel ingot production[1]	126.9	122.3	96.6	80.7	137.0
Automobile production[2]	82.0	83.8	82.8	73.9	135.2
Construction contracts[3]	58.6	55.3	51.4	73.8	122.2
Forest products carloadings[4]	61.2	61.2	61.6	54.6	122.2
Pittsburgh output and shipments[5]	101.8	101.4	89.2	66.7	128.4
COMBINED INDEX	86.1	84.8	76.3	69.9	129.0

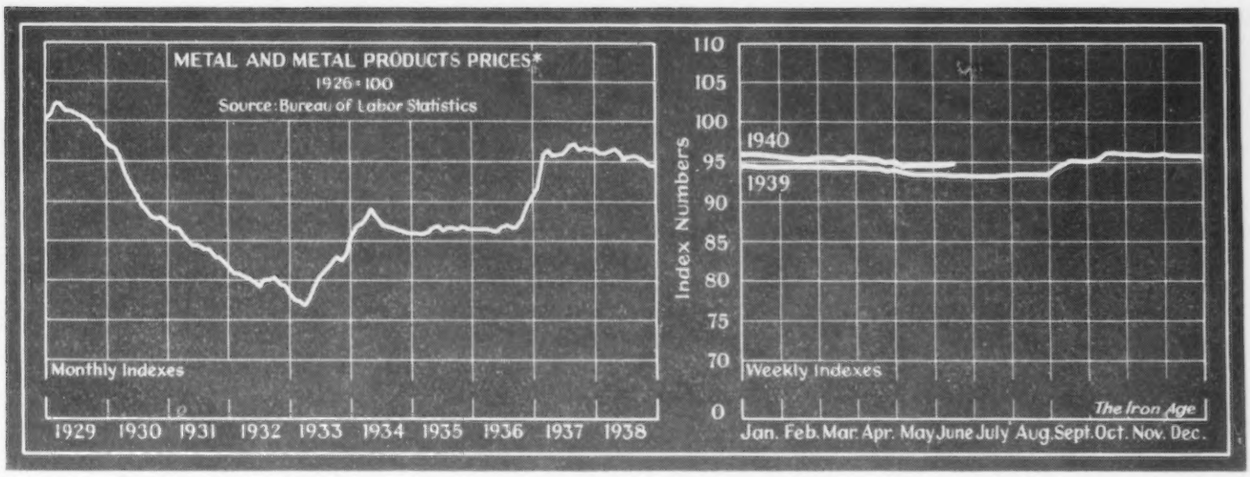
Sources: [1] THE IRON AGE; [2] Wards Automotive Reports; [3] *Engineering News-Record*; [4] Association of American Railroads; [5] University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ended June 15. Other indexes cover the week of June 22.

Rise in Rail Shipments Forecasts New Equipment Buying



*June estimated on basis of three weeks' data.

Cost of Metal Products Still Below First of Year



*Based on 147 items, including iron, steel, non-ferrous metals and finished products such as agricultural equipment, automobiles, tools, bolts, etc.

Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

Steel Operations

. . . Ingot output for week estimated at 88 per cent of capacity

Reports to THE IRON AGE indicate a further slight rise in steel ingot production this week, calculated at 88 per cent for the industry as a whole. The American Iron and Steel Institute on Monday estimated a rate of 86½ per cent for this week, a decline of 1.2 points from its estimated rate of the week before.

Only at CHICAGO has there been a slowing up of operations, according to THE IRON AGE reports. There the rate dropped from 93 to 92 per cent, but this is offset by a rise at PITTSBURGH from 82 to 83 per cent, while at various other centers there have been gains, notably at YOUNGSTOWN, where a rise of six points takes the rate up to 88 per cent, and in the SOUTHERN OHIO RIVER district, where a 10-point gain puts the rate up to 97½ per cent. The CLEVELAND-LORAIN district is three points higher at 85 per cent.

New Business

Total steel bookings at PITTSBURGH so far this month are running from 20 to 30 per cent ahead of the corresponding period a month ago. In some cases incoming business is sufficient to support operations close to theoretical capacity. The slight hesitation in bookings which occurred following the French capitulation was shortlived and, up to Tuesday, new business from domestic consumers was coming in at about the same rate as a week ago. Export demand from neutral countries continues relatively less in volume than has been the case but increased activity is expected.

The British have taken over French commitments on steel products which had been processed to completion at the time of the French capitulation and an official decision is to be made momentarily on the disposition of French orders now on mill books but on which work has been suspended. It is expected that the British will take this business over also, at least as it affects shell steel.

Some French orders for shell steel had been received by Chicago steel mills. At one of these mills, all work on the French orders has been suspended until definite instructions as to disposition of this material are received. At the other, no orders were going through the mill but some were on hand that had not yet been formally entered and these have been held up for instructions.

A large number of orders for steel of all kinds is still being received by Chicago sales offices. Bookings are running far ahead of a month ago, in some cases as much as double, and new business is exceeding the current operating rate in this district which is at near capacity. Hot rolled carbon bars, semi-finished steel and sheets and strip are the heaviest contributors to this imposing total of business. Other products are also active, however, with plates and structural shapes in the past few weeks being particularly good. Tin mills are operating at virtual capacity and, from business already on the books, this rate is likely to be maintained for some time.

Inventories of steel buyers in the CHICAGO district are increasing moderately and present stocks are estimated to be sufficient for from 60 to 75 days' operations at the present rate of activity. Steel warehouses are active buyers of a wide range of steel products and are apparently attempting to maintain their stocks at a high level in order to be in a good position to make prompt deliveries when and if mill backlogs reach a high point. Though mill backlogs are being built up all along, deliveries are as yet not at all bad on most products. Hot rolled bars and heavy hot rolled sheets may be obtained in two to three weeks' time and lighter sheets, both hot rolled and cold rolled, are available in four to five weeks.

Influenced by heavy railroad purchases and the expected release of automotive specifications, miscellaneous customers served by CLEVELAND and YOUNGSTOWN steel producers are finding it advisable to specify farther ahead than is their normal practice, thus insuring a definite position on rolling mill schedules. Steel buying at CLEVELAND and YOUNGSTOWN thus is well above the seasonal adverage and ahead of actual current steel consumption. From the standpoint of production, the present month at CLEVELAND and YOUNGSTOWN is the best of any June since 1929.

With the exception of tubular goods, in which there has been only minor improvement, sales of all steel products have gained in the NEW YORK district during the past week. The comparatively light demand for pipe is a reflection of a situation in the oil industry, where stocks above ground have been excessive, though they are now being worked down, and exports have declined owing to the rapid changes in the situation abroad. The delivery situation is becoming tighter on alloy steels, particularly those requiring heat treatment.

A railroad equipment and rail buying program appears to be in the making, details of which will be found under the heading "Railroad Buying." It is estimated by some car builders that as many as 50,000 to 60,000 cars may be purchased over the next few months.

Although new bookings in the past week in Philadelphia were slightly below the previous week's level, independent plate producers in EASTERN PENNSYLVANIA experienced a heavy influx of shipyard releases, which, coupled with general domestic demand, gave them the highest weekly bookings of the present year. The decline in general buying is attributed partly to the caution inspired by events abroad and partly to the fact that practically all domestic consumers, with the outstanding exception of the railroads, are amply covered on nearby needs. Rolling of French material is still suspended by eastern mills, although no actual cancellation has been received from the Anglo-

French Purchasing Board. A Philadelphia district car builder is preparing bids on 75,000 tons of shell steel for the British.

In ST. LOUIS there has been a marked increase in new business, but this came from firms either directly or indirectly interested in supplying war materials, making commitments for from 90 to 100 days ahead.

Pig Iron

. . . June shipments higher in most districts

• • • **Shipments at most** centers in June are ahead of any other month this year and in some districts, such as PITTSBURGH and ST. LOUIS, June sales continue to run ahead of May. Most domestic consumers, however, are covered for their third quarter needs.

Buying of pig iron by the British, which has increased somewhat during the last 10 days, is spreading toward the Middle West. In CLEVELAND and YOUNGSTOWN new orders have declined.

Buying in the EAST is without feature and the melting rate in the NEW YORK and other Eastern areas is little changed. While the crest of the buying wave at PHILADELPHIA passed several weeks ago, there still is a surprising demand for forward pig iron, coupled with rumors of a $2 a ton price increase later in the year.

Columbia Steel Co. has announced that third quarter price for No. 2 Foundry pig iron at Provo, Utah, will be raised $1 to $22 a gross ton.

At PITTSBURGH and other points steel makers are being hard pressed to fill deliveries without affecting their own needs.

An arrangement for operation of the Troy Furnace Corp.'s stack at Troy, N. Y., is being made by Republic Steel Corp. with the Hudson Valley Fuel Corp., giving Republic close at hand facilities for smelting its New York State ore.

Shipments so far this month at CHICAGO are continuing well in advance of a month ago. A large proportion of this iron is going to non-integrated mills for conversion into steel, but foundries are also stepping up their operations moderately.

Semi-Finished Steel

. . . Large demand not seriously affected by French capitulation

Semi-finished business in the PITTSBURGH district during the past week expanded considerably above the level of a week ago and was comparable to tonnages booked two weeks ago. While export demand in some cases has fallen off recently, there has been a pickup from some domestic consumers, notably in the movement of skelp. Tube rounds are moving briskly to non-integrated pipe mills and sheet bar bookings are holding at recent levels. With the British already committed to take over completed French steel business and with the almost certainty that unfilled tonnage which had been for France will be absorbed by the English, no letdown in the semi-finished market is expected.

At CHICAGO semi-finished steel is still in great demand. Some mills are unable to sell to the outside because the high operating rate requires the use of all available semi-finished steel within their own plants. In times such as these, generally speaking, only those plants with sufficient pig iron facilities to permit the manufacture of synthetic scrap can afford to supply any large tonnage of semi-finished steel to the open market. Non-integrated mills and forgers appear to be the best customers at the moment.

Large domestic inquiries have come before producers at CLEVELAND and YOUNGSTOWN, where the month of June is well above the average of this year to date in production, orders and shipments.

Wire Products

. . . Demand for rods and manufacturers' wire gains

Wire rod demand at PITTSBURGH expanded in the past week and bookings so far this month are considerably greater than the volume during the same number of days last month. Manufacturers' wire specifications are in greater number, reflecting the continuing tendency to supplement inventories which have reached a low point. Specifying against merchant wire business committed for over a month ago continues heavy.

Orders for manufacturers' wire and rods for shipment through the third quarter at current quoted prices are coming in at a brisk rate at CLEVELAND, where wire production is around 65 per cent of capacity. Buying apparently is ahead of actual consumption, many consumers showing a desire to avoid being frozen out of mill schedules. Production of merchant products is well maintained against previously placed orders. The year to date has been poor for merchant sales.

At CHICAGO wire sellers are anxiously awaiting some decision from Detroit as to 1941 cars since some of the largest users of manufacturers wire here are makers of springs for automobiles. Otherwise industrial consumption around CHICAGO is about on a par with a month ago. Demand from the country for merchant wire products continues good.

Sheets and Strip

. . . Specifications in good volume notwithstanding extension of deadline

Sheet and strip specifications in PITTSBURGH in the past week were in greater volume than in the week before. Nevertheless, considering the fact that the end of this month is the new deadline on the receipt of specifications against low priced commitments, the incoming volume is not up to expectations. Whether the new deadline of July 31 on shipments for low priced tonnage works out remains to be seen. Some flat rolled tonnage has been taken at the published price but the amount has by no means represented a test of the current price structure. Automobile concerns are taking some steel but are not an important factor yet.

A headline over last week's report stated that July 31 is the new deadline for specifications, which is incorrect, the deadline for specifications being June 30 and the deadline for shipments July 31.

It is now becoming obvious that, at Chicago at least, shipments of low priced sheets will extend throughout all of July and probably into August. The old

deadline of June 30, beyond which no sheets would be shipped, has been advanced one month and most sellers are making a strong effort to clean up all of this low priced tonnage by the end of July. In some Chicago sales offices it is reported that specifications have been received for most of the commitments made during late April and May. In some cases, particularly heavy hot rolled sheets, shipment can be made within two to three weeks. Light hot rolled and cold rolled sheets, however, are requiring four to five weeks at the least for shipment.

Demand for sheet steel in SOUTHERN OHIO continues at a rate of about 100 per cent of capacity. Foreign business has dropped off sharply to approximately 10 per cent of capacity. About two weeks ago foreign demand was up to about 35 per cent and the difference has now been more than absorbed by domestic ordering.

Specifications on low priced contracts were very heavy last week in the NEW YORK district, following the change in shipping deadline from June 30 to July 31. Sheet consumers are now taken care of on their needs through the third quarter and some well into the fourth quarter.

Merchant Bars

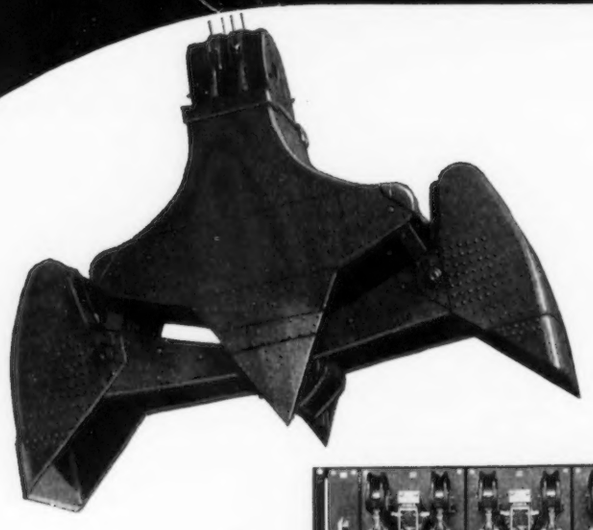
. . . Orders production and shipments gain, deliveries extended

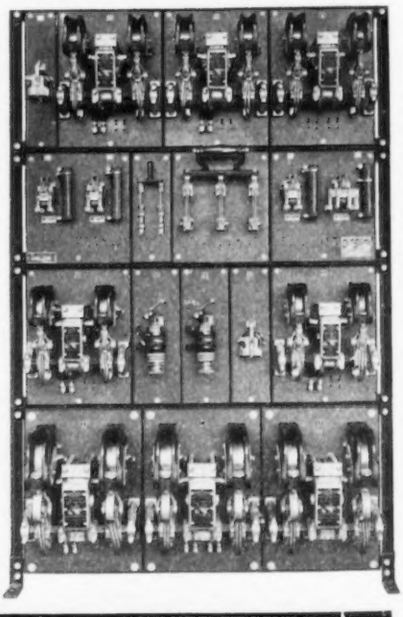
The French capitulation had little or no effect on the bar market at PITTSBURGH in the past week and orders so far this month are substantially ahead of business booked in the same period last month. Miscellaneous buying is strong despite the lack of support from the automotive industry. The British have definitely committed themselves for French business which had been completed and it is more than likely that unfilled tonnage will also be taken over by the English.

Bookings of hot rolled carbon bars at CHICAGO are well ahead of the same period a month ago and this trend shows no signs at present of being altered. Some CHICAGO mills are fairly well filled for the remainder of this quarter but others are still quoting two to three weeks' delivery on some sizes of hot rolled bars. Makers of automobile parts have not received any large advance orders for 1941 cars as yet, but it is said that they are ordering bars in advance in anticipation of these orders. Probably the largest individual industrial consumers are the farm equipment and farm and industrial tractor industries.

On orders, production and shipments, June is proving the best month since last fall at both CLEVELAND and YOUNGSTOWN. With delivery promises extended, consumers are ordering farther ahead and more generously than might be expected in view of the difficulty of seeing into the future. A feature of the market is a large inquiry for 6-in. rounds.

FAST OPERATION of 2-Motor Bucket-- hoists





EC&M 75 HP 220 Volt Frequency Relay Magnetic Controller for closing Line Motor on recent bucket crane. Duplicate controller is used for Holding Line Motor. Controllers are equipped with LINE-ARC Contactors and each is operated by an EC&M Type NT Master Switch as shown on opposite page.

THE ELECTRIC CONTROLLER & MFG. CO. E C & M CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

Structural Steel

. . . Defense work predominates in awards and inquiries

Fabricated structural steel awards declined to 14,900 tons from 18,850 tons last week. The largest lettings are 1825 tons for four naval storehouses at Oakland, Cal.; 1500 tons for the Curtiss-Wright Corp. at Caldwell, N. J., and 1050 tons for an extension to a machine shop building at the Philadelphia Navy Yard.

New structural steel projects at 23,750 tons are lower than a week ago. The bulk of inquiries is in the EAST with tonnages in small lots. Outstanding new jobs include 5400 tons at Chicopee Falls, Mass., for government hangars; 1500 tons for an addition to the Navy and Munitions Building, Washington; 1400 tons for hangars and annexes at Hill Field, Ogden, Utah, which is in addition to 4500 tons for a depot supply building reported last week; 1200 tons for 20 radial spillway gates for the Watts Bar Dam, Tenn.; 1100 tons for a power plant extension at Penns Grove, N. J., for the Deepwater Operating Co., and 1000 tons at Burlington, Vt., for Waterman Memorial Building at the University of Vermont.

Structural specifications at PITTSBURGH are stepping up slowly and mills have recently accumulated substantial rollings with further improvement expected.

with EC&M FREQUENCY RELAY MAGNETIC CONTROL

COUNTER-TORQUE permits Fast Bucket Opening

On bucket cranes operated by A.C. wound-rotor motors, the counter-torque method of control with EC&M Frequency Relays has important advantages. These are:—the ability to land the empty bucket carefully—to empty the bucket quickly—and to stop the motors without imposing severe duty on the holding brakes.

EC&M Frequency Relay Magnetic Control permits the use of weak values of counter-torque resulting in very accurate, slow control of the bucket for clean-up operations, when entering hatchways and similar restricted openings. There is no tendency for the bucket to overshoot or land hard, because the operator has graduated and refined control by means of the new EC&M Frequency Relay Equipment.

Under this system of operation, fast bucket opening can be secured and the brakes are relieved of the duty of stopping a descending load; they only hold the load after the bucket is at standstill. Ask for complete details.

Bolts, Nuts and Rivets

. . . June probably best month since January or February

Buying continues strong at CLEVELAND, where some producers expect June to be the best month since January or February. Automotive contracts are coming out for 1941 models, to be followed by releases later. Railroad car buying programs hold promise of providing considerable impetus over the next few months, as the carriers are specifying quick deliveries.

Railroad Buying

. . . Southern Pacific has $20,000,000 program, other roads buy

Coinciding with the announcement of the Association of American Railroads that the carriers are in good shape to meet any demands placed upon them by the defense program or from an increase in ordinary commercial traffic, was the issuing of further substantial inquiries for rolling stock and the placing of additional equipment and rail orders. The number of cars ordered in the past week was not as heavy as in the preceding week, when purchases totaled 2934 cars, but were above the weekly rate of the past several months.

Outstanding new inquiry is the Southern Pacific's $20,000,000 program involving 25 locomotives, 120 passenger cars, 1500 automobile

cars, 500 box cars, 125 flat cars and 30 to 35 cabooses.

Nickel Plate has ordered 125 freight cars from Bethlehem Steel; 250 from Pullman Standard Car Manufacturing Co., 200 from General American Transportation Co. and 300 light weight cars from American Car & Foundry Co. Mitsui & Co., representatives of Japanese interests, have ordered six locomotives from American Locomotive Co. and Detroit, Toledo & Ironton has purchased 50 hopper cars from Greenville Steel Car Co. Union Tank Co. has received authorization from I. C. C. to build 100 fusion-welded tank cars for experimental service.

Further indication of early purchases of fall rail requirements to avoid possible delays was visible in the past week. Chesapeake & Ohio and Nickel Plate have jointly purchased 46,000 tons for late fall delivery. The Chesapeake Road will receive 35,000 tons and the Nickel Plate 11,000 tons, including the 3800 tons previously placed. The 46,000 tons was allocated as follows: 25,650 tons to Carnegie-Illinois Steel Corp.; 14,880 to Inland Steel Co., and 5470 tons to Bethlehem Steel Co.

Inland Steel Co. has confirmed the purchase of 22,500 tons or rails and accessories by the Rio Grande do Sul Railway of Brazil, reported in THE IRON AGE, June 13, 1940.

Reporting on a survey of ability of American railroads to handle an increase in traffic, the A. A. R. stated that 36,000 more serviceable cars are available today than in October, 1939.

Minor changes have been made on the standard rail extras card which, for the most part, reflect clarification of language and the official inclusion in the list of changes made since the last one was issued, Sept. 1, 1938.

1431 NATIONALLY KNOWN MANUFACTURERS USE AMPCO METAL FOR DIFFICULT SERVICES...

—Let's LOOK INTO IT FOR OUR PRODUCTS

The increasing preference for Ampco Metal for highly stressed service parts is convincing evidence of its inherent superiority over most non-ferrous alloys. . . . Time and again, Ampco Metal has proved its extraordinary wear resistance — its strength and shock-proof qualities — its ability to often outwear hardened steel—in applications including gears, bushings, bearings, nuts, cams, shifters, thrust plates, forming and drawing dies.

You probably have a place for Ampco Metal in one or more of your products. Why not check with us. Send for data on Ampco Metal and its uses in modern industry.

AMPCO METAL, INC., Dept. IR-627, Milwaukee, Wis.

Tubular Goods

. . . A moderate pickup in orders from various sources

Total tubular sales at PITTSBURGH have shown a moderate pick up in the past 10 days, the improvement affecting practically every product. Jobbers are building up stocks of merchant pipe, boiler tube demand is expanding from railroad repair shops, miscellaneous mechanical tubing requirements are greater, and a mild increase in oil-country goods is noted.

Sales at CLEVELAND are described as being very good, particularly in merchant pipe. Stocks are being built up as a hedge against a possible tight situation in raw steel.

Reinforcing Bars

. . . Specifications in good volume and prices are steadier

Reinforcing bar specifications at PITTSBURGH are being received in good volume. Prices on new projects appear to be holding at 1.90c. a lb. level.

Reinforcing structural steel awards of 6350 tons include 1360 tons in Marin County, Cal., for a state viaduct and 1000 tons for the Brea Dam, Cal.

Iron Ore

. . . June consumption probably will be over 5,000,000 tons

Current blast furnace activity indicates that June consumption of Lake Superior iron ore will be over 5,000,000 tons, the heaviest since December or January. With the addition of 16 furnaces to the active list during May, consumption of ore jumped to 4,566,200 tons from the April level of 3,934,853 tons. In May, 1939, only 2,245,513 tons was consumed. Ore on hand at Lake Erie docks and furnaces totaled 19,603,350 gross tons on June 1, against 23,071,214 a year earlier. There were 137 stacks in blast May 31, against 121 at the end of April and 82 a year ago. The figures are supplied by the Lake Superior Iron Ore Association, Cleveland.

Ninety-eight per cent of the American Great Lakes vessel fleet was active June 15.

The Ironton mine of Republic Steel Corp. in the Gogebic Range, northern Michigan, has been reopened after two years' idleness.

By-Products

. . . Toluol price advanced 2c.

Toluol, coke by-product, has been advanced 2c. a gal. by leading steel mills and by-product coke producers. Coincident with an advance in the price of petroleum solvents, the present price of 2 deg. toluol for domestic consumption is now 27c. a gal., while the price of nitrated toluol or 1 deg. used in the preparation of T.N.T. has been advanced to 28½c. a gal. There has been no advance in the price of toluol to the British government, which price remains at 30c. a gal., although brokers have obtained as much as 60c. a gal.

Tin Plate

. . . Operations continue at 78%

Tin plate operations continue at 78 per cent, with incoming specifications maintaining the recent trend. Shipments are ahead of a month ago and some producers have placed additional hot mill units in service. A substantial amount of canned foods is slated to go to Europe soon for relief needs, chief product of which will be canned milk.

Plates

. . . Shipbuilding and railroad programs will tax the mills

Expanding railroad equipment buying together with the larger shipbuilding requirements for the U. S. Navy and the Maritime Commission promises to tax the capacity of plate mills during the next several months. Some of the larger plate producers now have a large volume of business on their books, but some of the smaller independent mills are not yet heavily engaged.

However, heavy shipyard releases in the past week gave several independent Eastern Pennsylvania producers their best week of the year.

Control
MOVING MASSES
easily
AN ADVANTAGE OF A-E-CO HELE-SHAW FLUID POWER

Triple-action hydraulic press manufactured by Dominion Engineering Company. Three downstroking rams may be used together or alternately to secure a variety of pressures. Pressures further adjustable by Hele-Shaw pump control.

WHEN you think of hydraulic operation do you get a picture of a slow moving platen on a ponderous press? Hele-Shaw Fluid Power *will* do that job because it's a brute for pressure. But forget it for a moment.

Take a look at a heavy, Fluid Power operated table on a face grinding machine doing a smooth 60 or better strokes per minute, or the big ram of a bull-dozer, or an airplane catapult and you'll see how easily heavy moving masses can be controlled with Fluid Power.

But there's more to Fluid Power (oil under pressure for driving machines)—mechanical simplicity, dependability, freedom from lubrication. There's infinitely variable control of speeds with fine, accurate control.

You can set-up machines for manual or completely automatic control over a multiplicity of simultaneous or sequential steps.

You can put the Hele-Shaw pump any convenient place on or off the machine . . . operate it by remote control.

Yes, you'll find Hele-Shaw Fluid Power has many other benefits. Tell us your problem and we'll gladly dig out a solution from our files or experience.

A-E-CO HELE-SHAW *Fluid* POWER

AMERICAN ENGINEERING COMPANY
2410 ARAMINGO AVENUE, PHILADELPHIA, PA.
Other A-E-CO Products: Lo-Hed Hoists, Taylor Stokers, Marine Deck Auxiliaries.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

British to Assume French Contracts

Cleveland

• • • **Production here** continues at about the same very high level as was attained in May when some new output records were established. One plant, which had on hand orders totaling $2,250,000 from the French, states the British have given assurance they want every machine and more, too. Screw machine manufacturers report that since French and English equipment was tooled exactly the same, most of the machines being for shell work, virtually the only change involved would be putting on new name plates.

The industry has been booking domestic orders at a very lively rate. Only one question holds interest for buyers these days and that is deliveries. Producers are set to ask for priority on certain equipment needed to step up their own output of machines for the United States government program.

Government Contracts Boost Sales

Chicago

• • • **New machine tool business** at Chicago is running well ahead of a month ago and in some cases backlogs are the largest since 1929. One sales office expects dollar volume in June to be as large as any month in its history and as yet there seems to be no letup in the demand for machinery in this district. Considerably more action as far as Government purchases are concerned is expected after the first of July when the Federal fiscal year begins and the 1941 appropriation for the Ordnance Department and the Rock Island Arsenal will be available. Conversations with the Chicago district office of the Ordnance Department reveal that they are expecting a considerably increased appropriation for the coming year, which means that many more plants in this area will receive business of this nature. The arsenal, of course, as has been pointed out in news items in THE IRON AGE, is taking bids from private manufacturers for tanks and scout cars. The arsenal in recent weeks has issued several inquiries for individual machine tools, they being noteworthy principally because a large amount of red tape was eliminated from the inquiry.

Machine tool builders in the Chicago area with orders for the French Government have not yet suspended any operations and are shipping as usual pending the receipt of instructions.

Market Undisturbed by War

Cincinnati

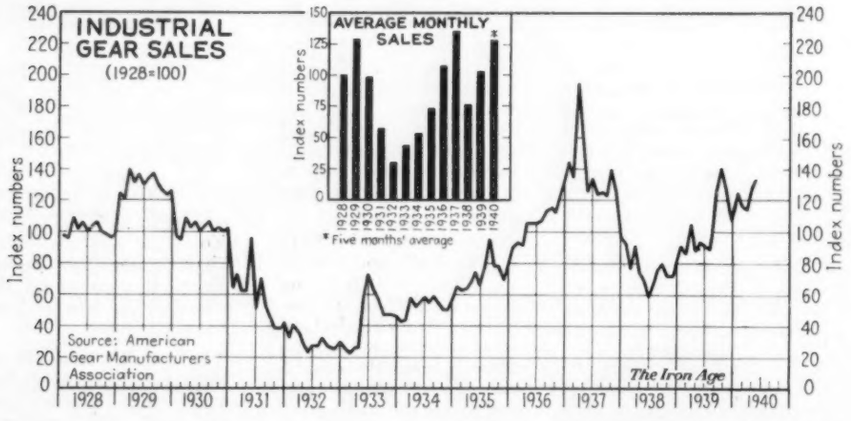
• • • **Recent war developments** have had no affect upon the district machinery market. By and large, manufacturers indicate there has been relatively no disturbance either by way of cancellation or shift of present orders to other interests, although the feeling is that at least those machines intended for French use will not be sent to their destination. These, however, are usable by the British as well as by domestic users and can easily be absorbed in the reported increasing domestic demand. A number of inquiries by American tool users for armament purposes are reported in the past week, and the early closing of substantial orders by the Ford Motor Co. for equipment to manufacture airplane motors is expected.

Demand for Priorities Increases

New York

• • • **Early appointment** of a man on the National Defense Advisory Committee detailed to rule on priorities on machine tool deliveries is looked for to relieve some of the pressure being brought to bear for even prompter delivery than is now being accorded the aircraft industry. Increased productivity of the machinery builders and deferment of Japanese and Russian orders is making delivery of some equipment surprisingly prompt, but the demand on the part of the aircraft industry for more and more equipment still goes on apace.

May Gear Sales Highest in Seven Months


INDUSTRIAL GEAR SALES
(1928=100)
AVERAGE MONTHLY SALES
Index numbers
* Five months' average
Source: American Gear Manufacturers Association
The Iron Age
1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940

INDUSTRIAL gear sales in May were the highest since November, 1939, and were 43 per cent above May, 1939, American Gear Manufacturers Association reports. The association's index of sales in May stood at 133, as compared with 128 in the preceding month and 93 in May, a year ago. The May gain is the third consecutive advance reported since the present year's low of 114 was reached in March. With the exception of October, 1939, when the index stood at 141, the May figure is the highest since October, 1937. Sales in first five months of the current year were 33 per cent ahead of the comparable period of 1939.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

New York, June 25—Non-ferrous markets in the past week continued to reflect the uncertainty felt by traders over the international aspect of copper, lead, zinc and tin markets. While it is generally assumed that the 75,000 tons purchased by the French several weeks ago will be taken by the British, no official information to that effect is available.

Commenting on expressed fears that this French tonnage might be dumped on the domestic market, C. Donald Dallas, president, Revere Copper & Brass, Inc., said last week that such fears were groundless. "Under the conditions imposed on all copper imports, French imports here, chiefly from Chilean mines, would be subject to a protective tariff of 4c. per lb.," Mr. Dallas said. He added, "Domestic stocks are not large. Metal available for delivery is scarce. Therefore, if copper futures have shown weakness, they reflect a general, rather than a specific condition."

Sales of copper in the past week amounted to about 10,000 tons, with chief interest still in nearby metal. Prices in the open market worked down to 11.20c. per lb., Connecticut Valley, by the end of the week, while custom smelters were asking 11.25c. Mine producers' quotations remain unchanged at 11.50c. Outside of some small Japanese purchases, the export market was very dull all week. Some prompt metal was sold for export this morning at 11.375c. per lb., f.a.s., but nearby metal in other directions was quoted at 11.10c. While South American purchases in this market are thus far almost negligible, exporters report "a growing demand which may eventually develop into an important outlet."

Tin

There is still a fairly insistent demand for nearby metal for large consumers endeavoring to build up stocks sufficient to carry over any temporary interruption of deliveries from the East. The daily volume of this buying, however, varies sharply on day-to-day developments abroad. Taking the past week as a whole, the turnover was not as heavy as in the preceding week. Prices worked up to a high of 55c. on Friday, but were off yesterday and again today, with nearby Straits being quoted this morning at 52.25c. per lb., New York. Current arrivals are substantially in excess of the actual consumption, but efforts to build up stock piles is maintaining an artificial shortage in nearby supplies.

Lead

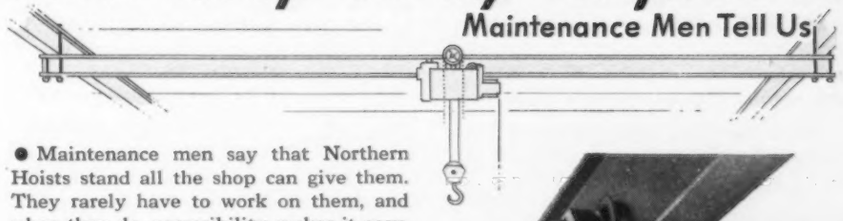
Lacking an incentive to make new commitments, due to their well covered positions with respect to both June and July, lead buyers showed little interest in the market in the past week. Sellers do not look for an increase in demand until August books are opened later this week. Quotations, meanwhile, remain unaltered at 4.85c. per lb., St. Louis.

Zinc

Prime Western buying in the past week showed a further decline, the period's sales amounting to only 2058 tons, as compared with 5033 tons in the previous week and 12,280 tons three weeks ago. Shipments for the week totaled 4879 tons and the prime Western backlog now stands at 55,880 tons. The present price of 6.25c. per lb., East St. Louis, is receiving considerable support from continued scarcity of nearby metal. Export demand is currently very light.

"Northern Hi-Lift Hoists don't keep us up nights"...

Maintenance Men Tell Us



● Maintenance men say that Northern Hoists stand all the shop can give them. They rarely have to work on them, and when they do, accessibility makes it easy.

Northern Hi-Lift Hoists are built to forestall maintenance. Liberal design—robust construction—welded rolled steel frame—machine cut, heat treated alloy steel gears—Hyatt Roller bearings. But when maintenance *is* needed, all parts are quickly accessible. Mechanical brake parts, for example, can be removed without removing the gear case. Electrical parts are all standard—easy to obtain.

Write for new Bulletin

NORTHERN ENGINEERING WORKS
2607 ATWATER ST. DETROIT, MICH.

CRANES Northern HOISTS

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

• • • **A decline of 34c.** in the composite price to $19.58 reflects the general reaction that has taken place in scrap markets during the past week as a result of uncertainties arising out of the war. No. 1 steel is off 50c. at Pittsburgh and the average is down 25c. both at Philadelphia and Chicago. Sharpest break took place at Youngstown, where the whole list is off $1.50 after rising $3 in as many weeks. Cleveland consumer prices are down $1. At Buffalo, No. 1 steel is holding its previous level, following a sale of 75,000 tons of scrap last week, but the No. 2 steel involved in this transaction has suffered a decline of 50c. Much of this material is to be shipped from the Eastern seaboard by barge.

With but one exception, dealer buying prices are softer. Offerings are off as much as $1.50 at Detroit. Cincinnati dealers' buying prices are unchanged, although there is practically no mill buying. Dealers' buying prices at St. Louis, on the other hand, have been advanced 25c. to $1, following a 5000-ton sale of No. 2 to a local mill.

The net result of change in sentiment has been to bring out large quantities of scrap that was being held for better prices, although brokers in the Pittsburgh district find supplies none too plentiful.

The composite price average for June is $19.31, as compared with $17.61 for May.

Philadelphia

Events of the past week have considerably dampened the bullish sentiment which has ruled in this market for some time. The only mill purchase during the week was a moderate tonnage of No. 1 at $20. Quotations have been adjusted to this basis, representing a decline of 25c. from the average of a week ago. Most mill buyers have withdrawn temporarily from the market, feeling that there is a possibility of a reaction on the downside. Broker offerings are reported particularly heavy and movement of manufacturers' scrap from New York and New England is steadily expanding.

Youngstown

Regulating the flow of scrap is the principal problem of mill buyers here after the very large sales 10 days ago induced plentiful supplies to this district. The price of No. 1 heavy melting is quoted at $20 to $20.50 this week, off $1.50.

Cleveland

The high prices paid June 13 for very large tonnages into mill consumption have broken the jam of tied-up scrap. No. 1 heavy melting is nominally priced at $19.50 to $20 a ton here this week, off $1 a ton.

Buffalo

Approximately 8000 tons of No. 2 steel and No. 2 bundles were sold into local consumption this week at prices within the respective ranges of $17 to $17.50 and $15.50 to $16. Subsequent smaller sales made to a large purchaser of last week has increased the aggregate tonnage sold this mill to about 75,000 tons.

St. Louis

An East Side melter bought between 5000 and 6000 tons of No. 2 heavy melting steel at $16.50 following which dealers advanced their prices 25c. a ton. The purchase was made from four dealers for shipment over the next 60 days. A few other items were higher. Shipments from the country are said to be slowing down. Railroad lists: Baltimore & Ohio, 7800 tons; Gulf Coast Lines, 1600 tons, and Wabash, 350 tons.

Cincinnati

The French capitulation brought some uncertainty to the district scrap market. Mills continue to make purchases of scrap, but show reluctance to pay increased prices. Some small weaknesses reported in other areas caused dealers here to hold their current bids to present levels.

Birmingham

The scrap situation here is unchanged. Dealers continue to be reluctant to dispose of their accumulations, awaiting a better price.

Boston

The market here is generally easier and the movement of material has been checked to some extent. Steel turnings, however, continue in demand and firm at $8 to $8.25 a ton on cars for Pennsylvania delivery. Alloy-free turnings for eastern Pennsylvania delivery sold up to $8.40 a ton on cars the past week, a new high for the current movement. Blast furnace material and bundled skeleton are the weakest spots in the list. Foundry buying of textile and machinery cast has gone into a slump. The export market holds steady.

Pittsburgh

Although recent sales of No. 1 heavy melting into consumption were made at $20.50 to $21 a ton this, grade is down this week because of dealer transactions to a level of $20 to $20.50, a drop of 50c. Despite the more pronounced weakness elsewhere, brokers in this district find supplies none too plentiful. Specialties continue strong and the entire market seems to be poised, awaiting factors which will determine whether a gradual decline is setting in.

Chicago

A mill sale late last week at $19 confirmed the published quotations on this page a week ago. On Monday of this week, however, the same large mill was able to buy a moderate tonnage of heavy melting steel at $18.50. Apparently a great deal of scrap has come out of hiding in the past week and in the face of this larger quantity of material brokers have lowered their offering prices from $19 a week ago to $18.75 and now this week to $18.50. A few boats and many cars have been loaded for shipment to Canada.

Detroit

A general softening of the market in Detroit attributable to a reflection of conditions in surrounding areas has resulted in some reduction of scrap prices. The offering price for heavy melting steel is $16 F.O.B. cars which reduces last week's heavy melting quotation on this item by $1.50. Spotty weaknesses indicated by prices 50c. under the going market of last week have become apparent. This week, however, will see the closing of numerous automotive lists for July acumulations which are expected to prove quite light and will provide a test of prevailing quotations.

New York

A small amount of scrap has been bought by the Japanese to fill berth space, but no real tonnages have been placed nor are any likely for the present. This situation leaves Great Britain the only real customer, and the feeling is that the British are more interested in finished steel than scrap under present war conditions. Export buying prices are unchanged. Buying prices for scrap on cars are softer in keeping with the trend in Eastern Pennsylvania.

Toronto

Firm prices with heavy demand continue features of Canadian iron and steel scrap markets. It is not expected there will be any immediate advance in dealer buying prices due to the fact that in renewing contracts for third quarter mill consumers refused to raise prices. Supplies are coming in in heavy volume and most lines are in good supply. Imports have slowed down due to higher prices and it is chiefly such materials as No. 1 cast and stove plate now coming into Canada from the United States.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.00 to $20.50
Railroad heavy mltng.	21.50 to 22.00
No. 2 heavy melting	19.00 to 19.50
Railroad scrap rails	21.50 to 22.00
Rails 3 ft. and under	25.00 to 25.50
Comp. sheet steel	20.00 to 20.50
Hand bundled sheets	19.00 to 19.50
Heavy steel axle turn.	19.00 to 19.50
Machine shop turnings	14.50 to 15.00
Short shov. turnings	16.00 to 16.50
Mixed bor. & turn	11.50 to 12.00
Cast iron borings	11.50 to 12.00
Cast iron carwheels	20.50 to 21.00
Heavy breakable cast.	17.00 to 17.50
No. 1 cupola cast	20.50 to 21.00
RR. knuckles & coup.	25.50 to 26.00
Rail coil springs	25.50 to 26.00
Rail leaf springs	25.50 to 26.00
Rolled steel wheels	25.50 to 26.00
Low phos. billet crops	25.00 to 26.00
Low phos. punching	24.50 to 25.00
Low phos. heavy plate	23.50 to 24.00
Railroad malleable	23.50 to 24.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.00
No. 2 hvy. mltng. steel	19.00
Hydraulic bund., new	20.00
Hydraulic bund., old	$16.50 to 17.00
Steel rails for rolling	22.00 to 22.50
Cast iron carwheels	22.50 to 23.00
Hvy. breakable cast	21.00
No. 1 cupola cast	22.00 to 22.50
Mixed yard (f'd'y) cast	19.00 to 19.50
Stove plate (steel wks.)	17.00 to 17.50
Railroad malleable	23.00 to 23.50
Machine shop turn.	13.00 to 13.50
No. 1 blast furnace	12.00
Cast borings	12.00
Heavy axle turnings	17.00 to 17.50
No. 1 low phos. hvy.	24.00 to 24.50
Couplers & knuckles	24.00 to 24.50
Rolled steel wheels	24.00 to 24.50
Steel axles	23.00 to 23.50
Shafting	24.50 to 25.00
Spec. iron & steel pipe	17.00 to 17.50
Cast borings (chem.)	14.00 to 14.50

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$18.50
Auto. hvy. mltng. steel alloy free	$17.00 to 17.50
No. 2 auto steel	14.75 to 15.25
Shoveling steel	18.50
Factory bundles	17.50 to 18.00
Dealers' bundles	16.00 to 16.50
No. 1 busheling	17.00 to 17.50
No. 2 busheling, old	8.00 to 8.50
Rolled carwheels	20.50 to 21.00
Railroad tires, cut	21.00 to 21.50
Railroad leaf springs	19.00 to 19.50
Steel coup. & knuckles	21.00 to 21.50
Axle turnings	17.25 to 17.75
Coil springs	22.00 to 22.50
Axle turn. (elec.)	18.75 to 19.25
Low phos. punchings	20.00 to 20.50
Low phos. plates 12 in. and under	20.50 to 21.00
Cast iron borings	11.25 to 11.75
Short shov. turn.	12.50 to 13.00
Machine shop turn.	12.50 to 13.00
Rerolling rails	23.00 to 23.50
Steel rails under 3 ft.	19.75 to 20.25
Steel rails under 2 ft.	22.00 to 22.50
Angle bars steel	20.00 to 20.50
Cast iron carwheels	18.75 to 19.25
Railroad malleable	22.50 to 23.00
Agric. malleable	14.75 to 15.25

	Per Net Ton
Iron car axles	23.50 to 24.00
Steel car axles	22.50 to 23.00
Locomotive tires	15.00 to 15.50
Pipes and flues	11.50 to 12.00
No. 1 machinery cast	17.00 to 17.50
Clean auto. blocks	18.00 to 18.50
No. 1 railroad cast	15.00 to 15.50
No. 1 agric. cast	13.50 to 14.00
Stove plate	12.00 to 12.50
Grate bars	12.50 to 13.00
Brake shoes	13.00 to 13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.00 to $20.50
No. 2 hvy. mltng. steel	19.00 to 19.50
Low phos. plate	21.50 to 22.00
No. 1 busheling	19.25 to 19.75
Hydraulic bundles	19.50 to 20.00
Machine shop turn.	13.50 to 14.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$19.50 to $20.00
No. 2 hvy. mltng. steel	18.50 to 19.00
Comp. sheet steel	$19.00 to $19.50
Light bund. stampings	15.50 to 16.00
Drop forge flashings	18.25 to 18.75
Machine shop turn.	13.00 to 13.50
Short shov. turn.	13.50 to 14.00
No. 1 busheling	19.00 to 19.50
Steel axle turnings	18.25 to 18.75
Low phos. billet and bloom crops	24.50 to 25.00
Cast iron borings	13.00 to 13.50
Mixed bor. & turn.	13.00 to 13.50
No. 2 busheling	13.00 to 13.50
No. 1 cupola cast	21.00 to 21.50
Railroad grate bars	15.00 to 15.50
Stove plate	15.00 to 15.50
Rails under 3 ft.	24.50 to 25.00
Rails for rolling	23.50 to 24.00
Railroad malleable	22.50 to 23.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$19.50 to $20.00
No. 2 hvy. mltng. steel	17.00 to 17.50
Scrap rails	22.50 to 23.00
New hvy. b'ndled sheets	17.00 to 17.50
Old hydraul. bundles	15.50 to 16.00
Drop forge flashings	17.00 to 17.50
No. 1 busheling	17.00 to 17.50
Machine shop turn.	11.50 to 12.50
Shov. turnings	13.00 to 13.50
Mixed bor. & turn.	11.50 to 12.00
Cast iron borings	11.50 to 12.00
Knuckles & couplers	23.00 to 24.00
Coil & leaf springs	23.00 to 24.00
Rolled steel wheels	23.00 to 24.00
No. 1 machinery cast	20.00 to 20.50
No. 1 cupola cast	18.50 to 19.00
Stove plate	16.00 to 16.50
Steel rails under 3 ft.	24.00 to 25.00
Cast iron carwheels	18.50 to 20.00
Railroad malleable	23.00 to 23.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	$17.00 to $17.50
No. 1 hvy. melting	16.50 to 17.00
No. 2 hvy. melting	15.50 to 16.00
No. 1 locomotive tires	19.00 to 19.50
Misc. stand. sec. rails	20.00 to 20.50
Railroad springs	20.00 to 20.50
Bundled sheets	11.50 to 12.00
Cast bor. & turn.	8.00 to 8.50
Machine shop turn.	9.50 to 10.00
Heavy turnings	12.50 to 13.00
Rails for rolling	21.50 to 22.00
Steel car axles	21.50 to 22.00
No. 1 RR. wrought	14.00 to 14.50
No. 2 RR. wrought	16.00 to 16.50
Steel rails under 3 ft.	21.50 to 22.00
Steel angle bars	19.00 to 19.50
Cast iron carwheels	19.00 to 19.50
No. 1 machinery cast	19.00 to 19.50
Railroad malleable	19.00 to 19.50
Breakable cast	18.50 to 19.00
Stove plate	16.50 to 17.00
Grate bars	14.50 to 15.00
Brake shoes	14.50 to 15.00

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$15.50 to $16.00
No. 2 hvy. mltng. steel	14.00 to 14.50
Scrap rails for mltng.	21.00 to 21.50
Loose sheet clippings	10.25 to 10.75
Hydrau. b'ndled sheets	14.75 to 15.25
Cast iron borings	7.00 to 7.50
Machine shop turn.	8.00 to 8.50
No. 1 busheling	11.50 to 12.00
No. 2 busheling	5.75 to 6.25
Rails for rolling	22.50 to 23.00
No. 1 locomotive tires	17.00 to 17.50
Short rails	23.00 to 23.50
Cast iron carwheels	17.00 to 17.50
No. 1 machinery cast	19.50 to 20.00
No. 1 railroad cast	18.00 to 18.50
Burnt cast	11.50 to 12.00
Stove plates	11.50 to 12.00
Agricul. malleable	16.00 to 16.50
Railroad malleable	19.00 to 19.50
Mixed hvy. cast	16.75 to 17.25

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	$16.00
No. 2 hvy. melting steel	15.00
No. 1 busheling	14.00
Scrap steel rails	15.00
Steel rails under 3 ft.	16.00
Rails for rolling	16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	10.00
Steel axles	18.00
No. 1 RR wrought	14.00
No. 1 cast	17.00
No. 2 cast	12.50
Cast iron carwheels	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 heavy melting	$15.50 to $16.00
No. 2 heavy melting	14.50 to 15.00
Borings and turnings	11.00 to 11.50
Long turnings	10.50 to 11.00
Short shov. turnings	11.25 to 11.75
No. 1 cast	20.00 to 20.50
Automotive cast	20.00 to 20.50
Hvy. breakable cast	16.50 to 17.00
Stove plate	13.00 to 13.50
Hydraul. Comp. sheets	17.50 to 18.00
New busheling	16.00 to 16.50
Sheet clips	14.50 to 15.00
Flashings	15.50 to 16.00
Low phos. plate	18.50 to 19.00

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	$15.00 to $15.50
No. 2 hvy. mltng. steel	13.50 to 14.00
Hvy. breakable cast	15.50 to 16.00
No. 1 machinery cast	17.50 to 18.00
No. 2 cast	15.00 to 15.50
Stove plate	12.50 to 13.00
Steel car axles	20.00 to 20.50
Shafting	20.00 to 20.50
No. 1 RR. wrought	14.50 to 15.50
No. 1 wrought long	13.00 to 13.50
Spec. iron & steel pipe	12.00 to 12.50
Rails for rolling	16.50 to 17.50
Clean steel turnings*	8.50 to 9.00
Cast borings*	8.50 to 9.00
No. 1 blast furnace	8.50 to 9.00
Cast borings (chem.)	10.00 to 11.00
Unprepared yard scrap	9.00 to 9.50
Light iron	7.00 to 7.50

Per gross ton delivered local foundries:

No. 1 machin. cast	$19.00 to $20.00
No. 2 cast	18.00 to 18.50

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton:

Breakable cast	$15.00 to $15.25
Machine shop turn.	8.00 to 8.40
Mixed bor. & turn.	7.00 to 7.25
Bun. skeleton long	11.50 to 12.25
Shafting	18.75 to 19.00
Stove plate	11.00 to 11.25
Cast bor. chemical	8.50 to 9.00

Per gross ton delivered consumers' yards:

Textile cast	$17.00 to $19.00
No. 1 machine cast	17.00 to 19.00

Per gross ton delivered dealers' yards:

No. 1 hvy. mltng. steel	$14.25 to $14.50
No. 2 steel	13.25 to 13.50

PACIFIC COAST

Per net ton delivered to consumer:

	San Fran.	Los Ang.	Seattle
No. 1 hvy. mltng. steel	$13.00	$13.00	$14.00
No. 2 hvy. mltng. steel	12.00	12.00	13.00
Bundles	11.00	11.00	12.00

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel	$11.50	$11.00
No. 1 hvy. mltng. steel	11.25	10.75
No. 2 hvy. mltng. steel	10.00	9.50
Mixed dealers steel	8.75	8.25
Drop forge flashings	9.75	9.25
New loose clippings	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.25	6.75
Cast borings	6.75	6.25
Machinery cast	20.00	19.00
Dealers' cast	19.00	18.00
Stove plate	14.00	13.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges

No. 1 hvy. mltng. steel	$15.50 to $16.00
No. 2 hvy. mltng. steel	13.50 to 14.00
No. 2 cast	14.00
Stove plate	12.00

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel	$15.50 to $15.75
No. 2 hvy. mltng. steel	14.00 to 14.25
Rail (scrap)	15.50 to 16.00
Stove plate	12.00 to 12.25

Philadelphia, delivered alongside boats, Port Richmond

No. 1 hvy. mltng. steel	$19.25
No. 2 hvy. mltng. steel	18.50

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings decline to 14,900 tons from 18,850 tons last week; new projects lower at 23,750 tons; plate awards only 105 tons.

AWARDS

NORTH ATLANTIC STATES

1500 Tons, Caldwell, N. J., buildings for Curtiss-Wright Corp., to Harris Structural Steel Co., Plainfield, N. J.

1050 Tons, Philadelphia, extension to machine shop building, No. 18, Navy Yard, to Lehigh Structural Steel Co., Allentown, Pa.

600 Tons, New York, Hutchinson River Parkway bridge, for Triboro Bridge Authority, to American Bridge Co., Pittsburgh.

355 Tons, Union County, N. J., State bridges, Route 29, to Bethlehem Steel Co., Bethlehem, Pa.

285 Tons, Elizabeth, N. J., Graycian Co. building, to Oltmer Iron Works, Jersey City, N. J.

270 Tons, St. Lawrence County, N. Y., State highway bridge, to American Bridge Co., Pittsburgh.

230 Tons, Harrisburg, Pa., boiler supports, Combustion Engineering Co., to Bethlehem Contracting Co., Bethlehem, Pa.

230 Tons, Baltimore, National Guard hangar, to Bethlehem Steel Co., Bethlehem, Pa.

215 Tons, Tamaqua, Pa., State highway bridge, to Bethlehem Steel Co., Bethlehem, Pa.

200 Tons, Bendix, N. J., building for Air Associates, Inc., to American Bridge Co., Pittsburgh.

150 Tons, Pittsfield, Mass., roof for court buildings Nos. 42 and 43, for General Electric Co., to Bethlehem Steel Co., Bethlehem, Pa.

150 Tons, New Brunswick, N. J., alterations to high school, to Bethlehem Steel Co., Bethlehem, Pa.

150 Tons, Baltimore, air station building for city, to Dietrich Bros., Baltimore.

110 Tons, Hackettstown, N. J., arts and science building, to H. R. Goeller, Inc., Hillside, N. J.

105 Tons, Cambridge, Mass., Shaler Hall and Fisher Museum, for Harvard University, to Haarman Steel Co., Holyoke, Mass.

SOUTH AND SOUTHWEST

370 Tons, Safford, Ariz., State bridge FAS-12-A, to Bethlehem Steel Co., Bethlehem, Pa.

265 Tons, Mannington, W. Va., State bridge, to Riverside Steel Co., Wheeling, W. Va.

230 Tons, Watts Bar Dam, Tenn., operating bridge over spillways for TVA, to Milwaukee Bridge Co., Milwaukee.

200 Tons, Southard, Okla., United States Gypsum Co. building, to J. B. Klein Iron & Foundry Co., Oklahoma City.

195 Tons, Wheeling, W. Va., Sears-Roebuck store, to Riverside Steel Co., Wheeling.

150 Tons, Watts Bar Dam, Tenn., operating bridge over spillways, for TVA, to Reliance Steel Products Co., Pittsburgh.

150 Tons, Gate City, Va., highway bridge, to Virginia Bridge Co., Roanoke, Va.

135 Tons, Clay and St. Johns Counties, Fla., bridge, to Nashville Bridge Co., Nashville, Tenn.

120 Tons, Chester, W. Va., factory addition, to Keystone Engineering Co., Pittsburgh.

110 Tons Rockbridge County Va. highway bridge to Virginia Bridge Co. Roanoke, Va.

CENTRAL STATES

575 Tons Willoughby, Ohio, addition to warehouse and passageway building, for Ohio Rubber Co., to Bethlehem Steel Co., Bethlehem, Pa.

525 Tons, Detroit, factory and office building for Soss Mfg. Co., to Whitehead & Kales Co., Detroit.

502 Tons, Chicago, 1940 bridge requirements for Rock Island railroad, to American Bridge Co., Pittsburgh.

380 Tons, Chicago, Sears-Roebuck & Co. store, to Joseph T. Ryerson & Son, Inc., Chicago.

375 Tons, Cincinnati, Winton Terrace housing project, to Bethlehem Steel Co., Bethlehem, Pa.

350 Tons, St. Louis, buildings for Blanton Co., to Mississippi Valley Structural Steel Co., St. Louis.

340 Tons, Chicago, subway section D6E, to Joseph T. Ryerson & Son, Inc., Chicago, through M. J. Boyle & Co., Chicago.

290 Tons, Lansing, Mich., extension to press building for Oldsmobile Division, to Whitehead & Kales Co., Detroit.

265 Tons, Ladysmith, Wis., State bridge, FP8574, to American Bridge Co., Pittsburgh.

160 Tons, Crawfordsville, Ind., bridge contract 1979, to Central States Bridge & Structural Co., Indianapolis.

150 Tons, Detroit, building for Fanny Farmer Candy Shops, to Whitehead & Kales Co., Detroit.

140 Tons, Mount Pleasant, Mich., warehouse extension for Isabella Sugar Co., to International Steel Co., Evansville, Ind.

125 Tons, Rawson, Wis., bridge No. 373, for Chicago & North Western Railroad Co., to Worden-Allen Co., Milwaukee.

120 Tons, Toledo, office and factory addition for Haughton Elevator Co., to an unnamed bidder.

WESTERN STATES

1825 Tons, Oakland, Cal., four Naval storehouses, to Duffin Iron Co., Chicago.

460 Tons, Brea, Cal., Brea Dam bearing piles and shapes, to Bethlehem Steel Co., Los Angeles, through Winston Bros., Los Angeles, contractor.

400 Tons, Los Angeles, plant addition for Vultee Aircraft Co., to Consolidated Steel Corp., Los Angeles.

225 Tons, Los Angeles, railroad bridges at Sepulveda Dam across Los Angeles River and Bull Creek, to Columbia Steel Co., Los Angeles, through Lovrich & Konjevod, Los Angeles, contractors.

100 Tons, Tacoma, Wash., Hylebos Waterway crossing towers, to Bethlehem Steel Co., San Francisco.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

5400 Tons, Chicopee Falls, Mass., hangars, for Government.

1500 Tons, Washington, addition to Navy and Munitions building.

1106 Tons, Penns Grove, N. J., power plant extension for Deepwater Operating Co.

1000 Tons, Burlington, Vt., Waterman Memorial building for University of Vermont.

700 Tons, Pittsburgh, extension to power house for Duquesne Light Co.

600 Tons, New York, Pelham Parkway bridge for Triboro Bridge Authority.

550 Tons, Arnold, Pa., extension to building No. 242, for Aluminum Co. of America.

450 Tons, Mechanicville, N. Y., boiler house addition, for West Virginia Pulp & Paper Co.

375 Tons, Brooklyn, building for E. R. Squibb & Sons.

300 Tons, Springfield, Mass., chemical manufacturing plant.

250 Tons, Hancock, Md., Tonoloway Creek bridge for State.

250 Tons, Philadelphia, bridge.

235 Tons, Dover Plains, N. Y., railroad crossing elimination, projects R.C. 40-59 and 40-60.

220 Tons, New York, dumping board contract 9-C.

220 Tons, New York, reconstruction State bridge, East 204th Street.

220 Tons, Richmond, N. Y., addition to Public School No. 29.

200 Tons, Kingston, N. Y., reconstruction of nine bridges for New York Central Railroad.

200 Tons, Philadelphia, boiler house for Henry Disston & Sons.

175 Tons, South Dennis, N. J., railroad overpass, route 49, section 16.

170 Tons, Worcester, Mass., stadium.

170 Tons, York, Pa., factory building for York Safe & Lock Co.

150 Tons, Belwood Park, N. J., bridge for Erie Railroad Co.

158 Tons, Erie County, N. Y., railroad crossing elimination, project R.C. 40-53.

140 Tons, Tunkhannock, Pa., reconstruction of State highway bridge.

130 Tons, East Windsor, Conn., State bridge.

130 Tons, Willimantic, Conn., State bridge.

120 Tons, Niagara Falls, N. Y., buildings No. 76, 77, 78, and 79, for Mathieson Alkali Works.

120 Tons, Merchanicville, N. Y., boiler supports, for West Virginia Pulp & Paper Co.

120 Tons, Chester Hill, Pa., State highway bridge.

120 Tons, Seely Creek, N. Y., highway bridge, project R.C. 40-58.

THE SOUTH

1200 Tons, Watts Bar Dam, Tenn., 20 radial spillway gates, for TVA.

300 Tons, State of Oklahoma, two highway bridges, bids July 2.

120 Tons, Millington, Tenn., bridge for Illinois Central Railroad.

120 Tons, Charleston, W. Va., warehouse addition for West Virginia Liquor Control Commission.

Weekly Bookings of Construction Steel

Week Ended ——→	June 25, 1940	June 18, 1940	May 28, 1940	June 27, 1939	Year to Date 1940	Year to Date 1939
Fabricated structural steel awards	14,900	18,850	18,000	12,850	378,580	489,675
Fabricated plate awards	105	0	4,030	125	69,490	90,780
Steel sheet piling awards	485	2,100	250	2,200	19,125	32,755
Reinforcing bar awards	6,350	19,650	5,800	17,125	216,750	243,470
Total Letting of Construction Steel	21,840	40,600	28,080	32,300	683,945	856,680

CENTRAL STATES

1200 **Tons,** Cook County, Ill., State highway bridge; bids taken.
850 **Tons,** Philo, Ohio, power house extension for Ohio Power Co.
660 **Tons,** Joliet, Ill., power station No. 9, unit No. 4, for Public Service Co. of North Illinois.
400 **Tons,** River Rouge, Mich., building for General Chemical Co.
300 **Tons,** Chicago, shops and parking deck building, for Marshall Field Estate.
200 **Tons,** Chicago, Chemical Products building for Sherwin-Williams Co.; bids in.
150 **Tons,** St. Louis, bridge between buildings for General Motors Corp., Fisher Body Division.
120 **Tons,** Iowa and Minnesota, bridges for Milwaukee Road

WESTERN STATES

1400 **Tons,** Ogden, Utah, Hill Field hangars and annexes. This inquiry is in addition to that last week for a depot supply building.
440 **Tons,** California and Oklahoma, bridges, for Atcheson, Topeka & Santa Fe Railroad Co.
180 **Tons,** Stockton, Cal., New Jacobs bridge No. 1; bids June 29.
158 **Tons,** Raymond, Wash., Bonneville substation addition; bids in.
157 **Tons,** Shasta County, Cal., Fender Ferry bridge over Pit River for Public Roads Administration; bids July 9.
150 **Tons,** Friant, Cal., bearing piles for San Joaquin River bridges.
150 **Tons,** Colorado Springs, Colo., State bridge.

FABRICATED PLATES

PENDING PROJECTS

10,800 **Tons,** Santa Ana, Cal., Metropolitan Water District, Orange County feeder pipe line, if steel alternate is used.
105 **Tons,** Odair, Wash., Bureau of Reclamation, to Koppers Co., Pittsburgh.

SHEET PILING

AWARDS

265 **Tons,** Brea, Cal., Brea Dam, to Bethlehem Steel Co., Los Angeles, through Winston Brothers, Los Angeles, contractors.
220 **Tons,** Los Angeles, railroad bridges at Sepulveda Dam over Los Angeles River and Bull Creek, to Columbia Steel Co., Los Angeles, through Lovrich & Konjevod, Los Angeles, contractors.

Reinforcing Steel

Awards of 6350 tons; 6100 tons in new projects

AWARDS

ATLANTIC STATES

550 **Tons,** Otsego Co., N. Y., bars and mesh for State highway project to Truscon Steel Co., Youngstown, through Arute Bros., general contractors.
335 **Tons,** Binghamton, N. Y., flood wall, section No. 1, to Bethlehem Steel Co., Bethlehem, Pa.; Pepper Bros. and C. D. Murray, Inc.
142 **Tons,** New York, East River bulkhead, contract 22, to Bethlehem Steel Co., Bethlehem, Pa., through J. Rich Steers, contractor.
125 **Tons,** Rochester, N. Y., School for the Deaf, to Truscon Steel Co., Youngstown, through John B. Pike & Sons.

SOUTH AND CENTRAL

450 **Tons,** Dayton, Ohio, McCook Field housing, to Pollak Steel Co., Cincinnati, through W. R. Goss, contractor.
400 **Tons,** Omaha, Neb., plant for Cudahy Packing Co., to Sheffield Steel Corp., Kansas City, through Philip McArdle, contractor.
350 **Tons,** Omaha, sewage plant, to Sheffield Steel Corp., Kansas City.
285 **Tons,** Bulloch and Screven Counties, Ga., State highway project, to Truscon Steel Co., Youngstown, through Coffey Construction Co.
230 **Tons,** Portsmouth, Ohio, Wayne Hills housing, to West Virginia Rail Co.; W. A. Sheets & Sons, contractors.
205 **Tons,** Milwaukee, box sewer for city, to Youngstown Sheet & Tube Co., Youngstown, through Worden-Allen Co., Milwaukee.
130 **Tons,** Lansing, Mich., John Deere & Co., building, to Inland Steel Co., Chicago.
100 **Tons,** Sheboygan, Wis., sewage treatment plant, to Truscon Steel Co., Youngstown, through Hron Brothers, general contractors.

WESTERN STATES

1360 **Tons,** Marin County, Cal., State viaduct, to Truscon Steel Co., Youngstown, through Heafey-Moore and Frederickson & Watson Construction Co., Oakland, Cal.
1000 **Tons,** Brea, Cal., Brea Dam, to Soule Steel Co., Los Angeles, through Winston Brothers, Los Angeles, contractor.
250 **Tons,** Rock Springs, Wyo., overhead crossing to Colorado Fuel & Iron Co., Denver.
144 **Tons,** Los Angeles, ballroom for Southern California Enterprises, to Truscon Steel Co., Los Angeles.
120 **Tons,** Los Angeles, Big Tujunga Wash bridge, to Ceco Steel Products Co., Los Angeles, through Person & Hollingsworth, Los Angeles, contractors.

CANAL ZONE

182 **Tons,** Panama Canal, schedule No. 4100, to Youngstown Sheet & Tube Co., Youngstown.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

320 **Tons,** Orange County, N. Y., highway project F.A.R.C. 40-57.
250 **Tons,** Seaford, Del., bridge.
200 **Tons,** Stamford, Conn., housing project.
123 **Tons,** Waterloo, N. Y., highway project F.A.R.C. 40-54.
111 **Tons,** Luzerne County, Pa., State highway project R11 and R177.
100 **Tons,** Fort Ann, New York highway project, F. A. S., S.H. 40-1.
100 **Tons,** Auburn, N. Y., highway project F.A.R.C. 40-52.
100 **Tons,** Dover Plains, N. Y., highway projects R.C. 40-50 and 40-60.
100 **Tons,** South Dennis, N. J., railroad overpass, route 49, section 16.

CENTRAL STATES

400 **Tons,** Detroit, Grace Hospital buildings.
400 **Tons,** Chicago, Bureau of Sewers; bids taken.
400 **Tons,** Chicago, Sprague Warner Co.
250 **Tons,** Elgin, Ill., Fox River bridge; bids due June 28.
200 **Tons,** Lockport, Ill., elevator for Great Lakes Carbon Co.

WESTERN STATES

2300 **Tons,** Santa Ana, Cal., Orange County feeder pipe line (specification 335, Alt. P); bids July 10.
335 **Tons,** Friant, Cal., San Joaquin River bridges.
250 **Tons,** Los Angeles, San Fernando Reservoir improvements for Department of Water and Power; bids July 3.
120 **Tons,** Palo Alto, Cal., El Camino Real underpass; bids July 10.

Cast Iron Pipe

Lunenburg, Mass., has awarded 5,000 ft. of 8-in. pipe to United States Pipe & Foundry Co.

Swampscott, Mass., has awarded 175 tons of 6- and 12-in. pipe to Donaldson Iron Co., Emaus, Pa.

Board of Water Commissioners, 62 Lewis Street, Rahway, N. J., asks bids until July 8 for 374 ft. of 20-in., 1726 ft. of 16-in., 4212 ft. of 12-in., and 745 ft. of 8-in. pipe for water system. C. W. Ludlow is superintendent.

Waynesboro, Va., plans pipe lines for water system and other waterworks extensions and improvements. Fund of $218,500 has been secured through Federal aid for this and street construction.

Dakota City, Neb., asks bids until July 5 for pipe lines for water system and other waterworks equipment.

Sour Lake, Tex., plans pipe lines for water system extensions and improvements. Bond Issue of $50,000 is being arranged for work. H. L. Thackwell, Longview, Tex., is consulting engineer.

Travis County Water Control and Improvement District No. 2, Fiskville, near Austin, Tex., plans pipe lines for water system and other waterworks installation. Bond issue of $200,000 has been authorized for work. Trimble & Bandy, Austin, are consulting engineers.

Board of Water and Sewage Commissioners, 219 North Third Street, Stevens Point, Wis., closes bids July 8 for 4300 ft. of standard 5-in. single hub, 200 ft. of Standard 5-in. double hub, and 200 ft. of 6-in single hub cast iron soil pipe.

Montana Power Co., Butte, Mont., plans about one mile of 20-in. pipe for pressure water service, and two miles of 6-in. for water system at Missoula, Mont. Fund of about $70,000 has been authorized for this and connecting pipe lines at place noted.

Board of Water Commissioners, Marrero, La., asks bids until July 11 for three carloads of cast iron water main and spigot pipe, Class B, 150-lb. test.

Spring Lake, N. J., closes bids July 8 for cast iron pipe and fittings. E. H. Schmieder, 1109 Third Avenue, is borough engineer.

Los Angeles Department of Water and Power asks bids June 28 on 2800 tons of 6, 8, and 12-in. cement lined pipe (Specification 3448).

Board of Water Commissioners, Long Beach, Cal., asks bids June 27 on 650 tons of 6, 8, and 12-in pipe.

Pipe Lines

Missoula Coke & Gas Co., Missoula, Mont., plans new 10-in. galvanized welded pressure pipe line from Garrison, Mont., to Missoula, about 90 miles, for natural gas transmission. Proposed to use cast iron, welded joint pipe, wrapped.

Pure Oil Co., 35 East Wacker Drive, Chicago, has let contract to B. & M. Construction Co., Petroleum Building, Oklahoma City, Okla., for new 6-in. welded steel pipe line from oil field at Noble, Ill., to connection with main pipe line, about 20 miles, for crude oil transmission.

Panhandle Eastern Pipe Line Co., 101 West Eleventh Street, Kansas City, Mo., operating a pipe line system for natural gas transmission from Texas Panhandle district to points in Indiana, Illinois and Michigan, with branch lines in Missouri, Kansas, Oklahoma and other states, has authorized extensions in various parts of system, using 24, 22 and 20-in welded steel pipe for new loops and main lines, totaling 105 miles. Cost about $3,500,000. This will be a continuation of pipe line expansion under way for several months and now nearing completion, comprising about 142 miles of 22 and 24-in. welded steel pipe, representing an investment of about $3,500,000.

Pan-American Refining Corp., Texas City, Tex., has let contract to Archie Lacy, 2401 Bleeker Street, Houston, Tex., for new 8-in. welded steel pipe line from Alta Loma oil field, Tex., to Texas City, about 22 miles, for crude oil transmission to refinery at latter place.

Stanolind Pipe Line Co., Philcade Building, Tulsa, Okla., plans new 4-in. welded steel pipe line from Marshall, Okla., oil field to Aylesworth, Okla., about five miles, for crude oil transmission to storage and loading station at last noted point.

Bureau of Reclamation, Denver, asks bids until July 5 for 4 to 12-in. o.d., fabricated steel pipe for water distribution system at South Ogden, Utah, Ogden River project, Utah. (Specifications 1377-D).

Montana-Dakota Utilities Co., 831 Second Avenue South, Minneapolis, is arranging financing in amount of $1,550,000 for proposed new welded steel pipe line from Fort Peck, Mont., to Glendive, Mont., for natural gas transmission, recently noted in these columns. In addition to main line, branch lines will be built to Frazer, Nashua, Poplar, Wolf Point and Richey, Mont., with local distribution systems for gas service. Booster stations and other operating facilities will be installed, including control and meter stations in communities noted. Work is scheduled to begin in July.

State Board of Education, State Capitol, Helena, Mont., plans call for bids in July for 10-in. pressure pipe lines for steam distribution from central-heating plant at State University, Missoula, Mont. R. C. Hugenin, 1201 West Porphyry Street, Butte, Mont., is architect.

Atlantic Refining Co., 260 South Broad Street, Philadelphia, plans two 16-in. steel pipe lines from terminal at Fort Mifflin on Delaware River to oil refinery at Point Breeze, about five miles, for crude oil transmission for plant supply.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, M'FG Special coated (Per base box)	$4.30		$4 30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢					2.40¢	2.70¢			
Reinforcing (billet)[7]	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢			2.25¢	2.30¢	2.00¢		
Reinforcing (rail)[7]	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢				2.15¢	2.20¢	1.90¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢							2.70¢		
PLATES									(Coatesville and Claymont = 2.10¢)						
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢										
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢										
Spring	3.20¢	3.20¢		3.20¢	3.20¢										
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢					2.85¢	2.95¢			
IRON BARS															
Common		2.25¢			(Terra Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lots to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in to 8 in.	$54.00
8 in. to 12 in.	52.00
12 in to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the making of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85

	Base per 100 Lb.
Annealed fence wire	$3.05

	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	56
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and 6 in. and smaller	68½
Larger and longer up to 1 in.	66
1⅛ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts; c.p.c., t-nuts; square, hex., blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1⅛ in. to 1½ in. inclusive	62
1⅝ in. and larger	60

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. through 1½ in.	62	62
1⅝ in. and larger	60	60

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York, lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.40

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	June 19	June 20	June 21	June 22	June 24	June 25
Copper, Electrolytic[1]	11.50	11.50	11.50	11.50	11.50	11.50
Copper, Lake	11.50	11.50	11.50	11.50	11.50	11.50
Tin, Straits, New York	53.00	54.50	55.00	....	53.75	52.25
Zinc, East St. Louis[2]	6.25	6.25	6.25	6.25	6.25	6.25
Lead, St. Louis[3]	4.85	4.85	4.85	4.85	4.85	4.85

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

	New York	Cleveland
Tin		
Straits pig	54.00	56.50
Copper		
Lake	13.25	12.625
Electro	12.75	12.625
Castings	12.375	12.375
H. R. sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow, sheets*	18.56	18.56
Yellow, rods*	13.55	13.55
Seamless tubes*	21.31	21.31
Zinc		
Slabs	7.60	7.75
Sheets, No. 9 casks	12.00	12.00
Lead		
American pig	6.10	5.50
Bar	8.05	8.25
Cut sheets	8.25	8.25
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.50	21.50
No. 1 remelt., 98-99%	18.00	18.50
Solder		
½ and ½	32.50	32.50
Babbitt		
Anti-friction grade	22.25	22.00

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	9.00	9.625
Hvy. and wire	8.00	8.375
Light and bottoms	7.00	7.50
Brass		
Heavy	5.00	5.50
Light	4.00	4.75
No. 1 yel. turn	4.50	5.50
No. 1 red or compo. turn	7.75	8.25
Hvy. mach. compo.	8.00	8.625
Lead		
Heavy	4.00	4.375
Aluminum		
Cast	8.50	9.50
Sheet	14.00	15.00
Zinc	3.25	4.00

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 19c.-20c. a lb.; No. 12 remelt No. 2 standard, 18c.-19c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $200 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 12.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.55
2500 (5 Ni)	2.25
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.65
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.10
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.85
Cr-Ni-V	1.50
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c., carlots.

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H't strip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

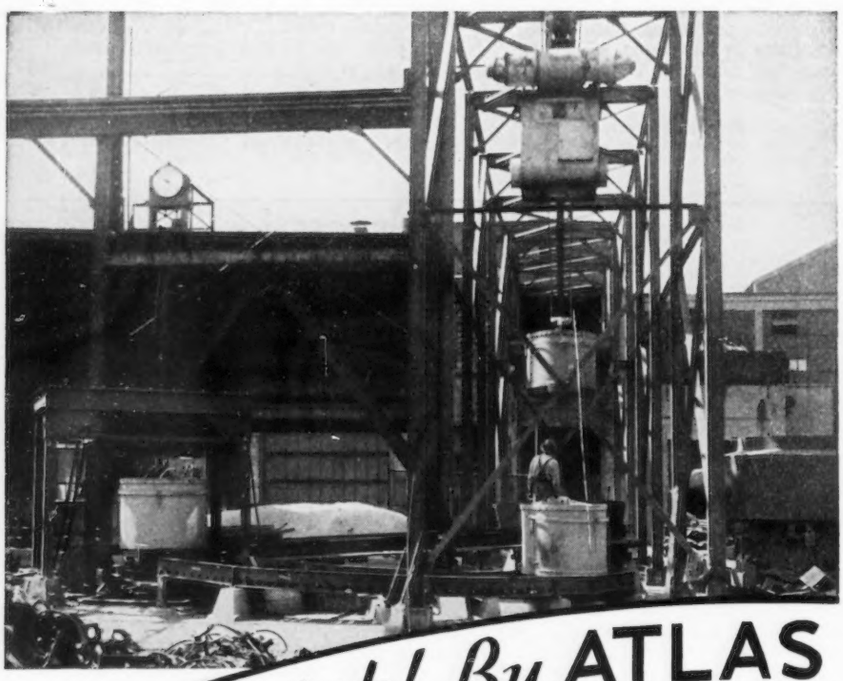
	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.



An Assist! By ATLAS

View at Prominent Iron Foundry

To Lower Costs!

Here Atlas - designed, Atlas - built equipment moves heavy scrap and other charging materials with consummate ease.

Monorail deposits empty bucket on roller conveyor. Bucket *rolls down* to scale platform, is charged with iron, weight read from yard crane cab. Scale platform lowers, turns, bucket *rolls down* to monorail for pick-up and charge to cupola.

A propitious circle, presaging profit at the year-end—and a definitely typical Atlas installation.

THE ATLAS CAR & MFG. CO.

Engineers **CLEVELAND, OHIO** ***Manufacturers***

serving the world with mobile handling equipment

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall.

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d.13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d.13 B.W.G.	10.67	9.26	....
1½ in. o.d.13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d.13 B.W.G.	13.42	11.64	11.06
2 in. o.d.13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d.13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d.12 B.W.G.	18.45	16.01	15.16
2½ in. o.d.12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d.12 B.W.G.	21.42	18.59	17.54
3 in. o.d.12 B.W.G.	22.48	19.50	18.35
3½ in. o.d.11 B.W.G.	28.37	24.62	23.15
4 in. o.d.10 B.W.G.	35.20	30.54	28.66
4½ in. o.d.10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price=$200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	36
¼ to ⅜ in.	59	43½
½ in.	63½	54
¾ in.	66½	58
1 to 3 in.	68½	60½

Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+30
½ in.	24	6½
¾ in.	30	13
1 and 1¼ in.	34	19
1½ in.	38	21½
2 in.	37½	21

Lap Weld

Steel		
2 in.	61	52½
2½ and 3 in.	64	55½
3½ to 6 in.	66	57¼
7 and 8 in.	65	55½
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	30½	15
2½ to 3½ in.	31½	17½
4 in.	33½	21
4½ to 8 in.	32½	20
9 to 12 in.	28½	15

Butt weld, extra strong, plain ends

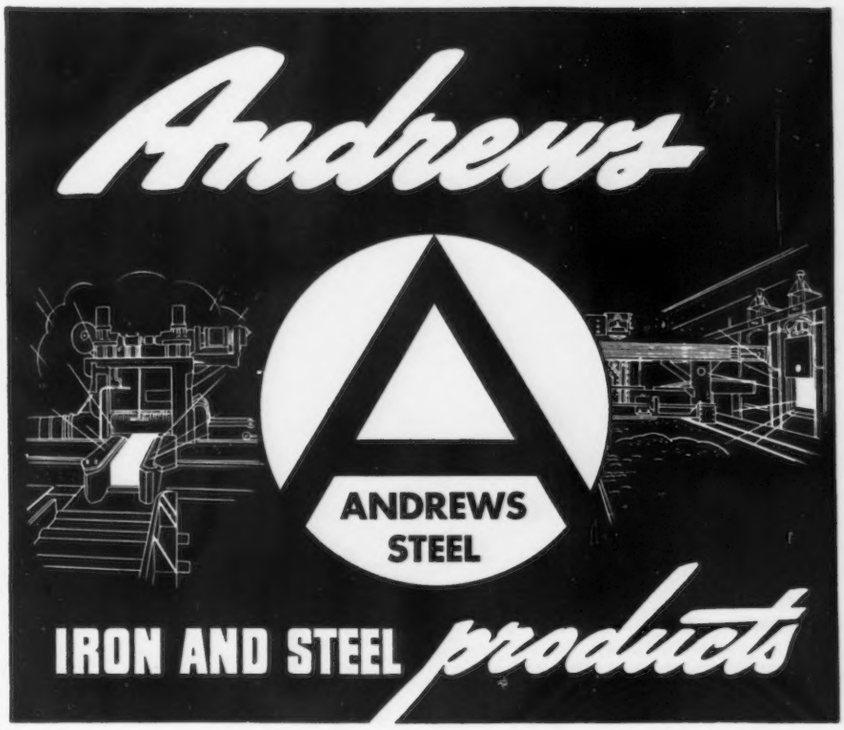
Steel	Black	Galv.
⅛ in.	54½	41½
¼ to ⅜ in.	56½	45½
½ in.	61½	53½
¾ in.	65½	57½
1 to 3 in.	67	60
Wrought Iron		
¼ and ⅜ in.	+10	+43
½ in.	25	9
¾ in.	31	15
1 to 2 in.	38	22½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	51½
2½ and 3 in.	63	55½
3½ to 6 in.	66½	59
7 and 8 in.	65½	56
9 and 10 in.	64½	55
11 and 12 in.	63½	54
Wrought Iron		
2 in.	33½	18½
2½ to 4 in.	39½	25½
4½ to 6 in.	37½	24
7 and 8 in.	38½	24½
9 to 12 in.	32	20½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.



After all, steel making at its best is a precision art in which the most important factor is man power. There's a knack to steel making that only the years can bring and only long experience sharpen. Here at Andrews we pride ourselves on our men and their superior steel making abilities. Every slab, bar, bloom or billet that leaves this plant bears the unmistakable imprint of each man's skill and craftsmanship. To select Andrews for your requirements is to make sure of two major essentials: (1) iron and steel products of unsurpassed quality, and (2) a wholly dependable source of supply.

In **Carbon and Alloy Steels:** Bars • Plates • Universal Mill Plates • Sheet Bars • Billets • Blooms • Slabs

THE ANDREWS STEEL CO.
NEWPORT, KENTUCKY
DIVISIONS
THE NEWPORT ROLLING MILL COMPANY
THE GLOBE IRON ROOFING & CORRUGATING CO.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Gross Ton
Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%....	4.60
Mesaba, non-bessemer, 51.50%	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

	Per Unit
Algerian, low P, Cu free, dry, 55 to 58% Fe	Nom.
Caucasian, washed, 52% Mn.	Nom.
African, Indian, 44 to 48% Mn.	Nom.
African, Indian, 49 to 51% Mn.	Nom.
Brazilian, 46 to 48% Mn.	52c.
Cuban, del'd, duty free, 51% Mn.	72c.

	Per Short Ton Unit
Tungsten, Chinese, Wolframite, duty paid, delivered	$23.50
Tungsten, domestic scheelite, delivered	23.50
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton:	
South African (low grade)	Nom.
Rhodesian, 45%	$24.00
Rhodesian, 48%	28.50

*All foreign ore prices are nominal. War conditions have prevented trading in Swedish and Turkish ores and all quotations have therefore been withdrawn.

RAILS, TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts, steam railroads	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR

	Per Net Ton
Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$20.00
Domestic, f.o.b. Ohio River landing barges	20.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	$20.50 to 21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid	$25.00 to $25.50
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	$31.00
As above, in bags, f.o.b. same mines	$32.60

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55

Chrome Brick

	Net per Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

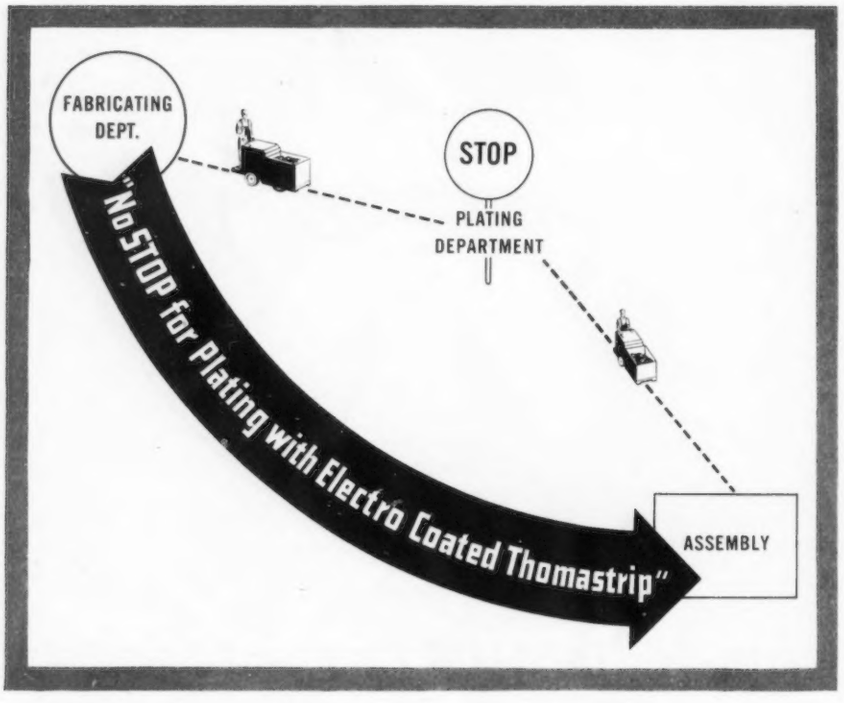
Magnesite Brick

Standard f.o.b. Baltimore and Chester	$72.00
Chemically bonded, f.o.b. Baltimore	61.00

Grain Magnesite

Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	$40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.



Less Handling of Parts With

ELECTRO COATED Thomastrip

COLD ROLLED STRIP STEEL

Bright Finish Uncoated and Electro Coated With Nickel, Brass, Copper, Bronze, Zinc, and Tin.

COLD ROLLED

When you use electro coated Thomastrip, plating operations in your plant may be entirely eliminated. After the parts are formed they move directly to the assembly department, uninterrupted by costly handling and delays for plating. One or more of the many Thomastrip electro coated finishes may prove profitable to you. They will not flake nor peel.

THE THOMAS STEEL CO.

SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

WARREN, OHIO

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered, Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload lots, bulk).....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$33.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.
For each unit of manganese over 2%. $1 per ton additional.
Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.
The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.
Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots. Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V., del'd $2.70 to $2.90†
Ferracolumbium, per lb. contained columbium, f. o. b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace, carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton.....$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton $58.50
Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville $75.00
Ferromolybdenum, per lb. Mo, f.o.b. furnace..... 95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.....4.75c.
No. 6, f.o.b. Bayonne, N. J.....3.21c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate, del'd Cleveland.5.25c.
No. 4 industrial, del'd Cleveland.5.00c.
No. 5 industrial, del'd Cleveland.3.75c.
No. 6 industrial, del'd Cleveland.3.25c.

Your Electric Hoists Should Be "Shaw-Box"!

...They Cost Less To Operate

7 Reasons Why

Only in Shaw-Box Hoists can you get these features that make them the most economical hoists to use, and for the work they do the least expensive to buy.

1 — "One-Point" Lubrication System
2 — Interchangeable Suspension
3 — "Fool Proof" Upper Stop
4 — Two-Gear Reduction Drive
5 — "Hyatt" Roller Bearings
6 — Totally Enclosed Construction
7 — Ball Bearing Motors

Shaw-Box Electric Hoists are doing the lifting in thousands of plants across the country, in all industries — lifting jobs like yours . . . Always they have speeded production, taken the burden from men, lowered costs and increased profits.

In the Shaw-Box line of Electric Hoists you will find the one you seek for your own necessities . . . Sizes range from 250 pounds to 20 tons lifting capacity in combinations and arrangements to meet every requirement of industry . . . Back of them are the hoisting experiences of operating men in thousands of plants in all industries, and, the experience of more than half a century devoted to the development and manufacture of cranes and hoists exclusively.

Send for catalog that contains complete information and many illustrations of profit making installations that may suggest an application to you.

Makers of all types and sizes of Electric and Hand Operated Cranes, and Electric Hoists, including the famous Portable Electric "Budgit" Hoists . . . ***Send all your inquiries for cranes and hoists to "Shaw-Box"!***

SHAW BOX CRANE & HOIST DIVISION
MANNING, MAXWELL & MOORE, INC.
402 Broadway MUSKEGON, MICHIGAN

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$4.00 to $4.25

Foundry, f.o.b. Connellsville, prompt .....$5.25 to 5.50

F'dry, by-product, Chicago.... 10.50

F'dry, by-product, New England 12.50

Foundry, by-product, Newark or Jersey City .....$11.30 to $11.90

F'dry, by-product, Philadelphia 11.13

F'dry, by-product, Cleveland... 11.05

F'dry, by-product, Cincinnati.. 10.50

Foundry, Birmingham 7.50

F'dry, by-product, St. Louis $10.75 to $11.00

Foundry, from Birmingham, f.o.b. cars dock Pacific ports.....$14.75

BRITISH

British

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export. £17 18s.

Tin plate, per base box 32s. to 33s.

Steel bars, open hearth £13 9s.

Beams, open hearth.... £12 2s. 6d.

Channels, open hearth.. £12 2s. 6d.

Angles, open hearth.... £12 2s. 6d.

Black sheets, No. 24 gage £17 max.*; £17 min.**

Galvanized sheets, No. 24 gage £19 10s. max.*; £19 10s. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$24.50***	***$24.00***	***$25.50***	***$25.00***	.....
Brooklyn	***26.50***	.....	.....	***27.00***	.....
Jersey City	***25.53***	***25.03***	***26.53***	***26.03***	.....
Philadelphia	***24.84***	***24.34***	***25.84***	***25.34***	.....
Bethlehem, Pa.	$24.00	$23.50	$25.00	$24.50	.....
Everett, Mass.	24.00	23.50	25.00	24.50	.....
Swedeland, Pa.	24.00	23.50	25.00	24.50	.....
Steelton, Pa.	.....	23.50	.....	.....	28.50
Birdsboro, Pa.	24.00	23.50	25.00	24.50	28.50
Sparrows Point, Md.	24.00	23.50	.....	.....	.....
Erie, Pa.	23.00	22.50	24.00	23.50	.....
Neville Island, Pa.	23.00	22.50	23.50	23.00	.....
Sharpsville, Pa.	23.00	22.50	23.50	23.00	.....
Buffalo	23.00	22.00	24.00	23.50	28.50
Cincinnati	***23.44***	***23.61***	.....	***24.11***	.....
Canton, Ohio	***24.39***	***23.89***	***24.89***	***24.39***	.....
Mansfield, Ohio	***24.94***	***24.44***	***25.44***	***24.94***	.....
St. Louis	***23.50***	***23.02***	.....	.....	.....
Chicago	23.00	22.50	23.50	23.00	.....
Granite City, Ill.	23.00	22.50	23.50	23.00	.....
Cleveland	23.00	22.50	23.50	23.00	.....
Hamilton, Ohio	23.00	22.50	.....	23.00	.....
Toledo	23.00	22.50	23.50	23.00	.....
Youngstown	23.00	22.50	23.50	23.00	.....
Detroit	23.00	22.50	23.50	23.00	.....
St. Paul	***25.63***	.....	***26.13***	***25.63***	.....
Duluth	23.50	.....	24.00	23.50	.....
Birmingham	19.38*	18.00	24.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE

Valley or Pittsburgh fce.....$22.50

CHARCOAL

Lake Superior fce.....$27.00
Delivered Chicago 30.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

*Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

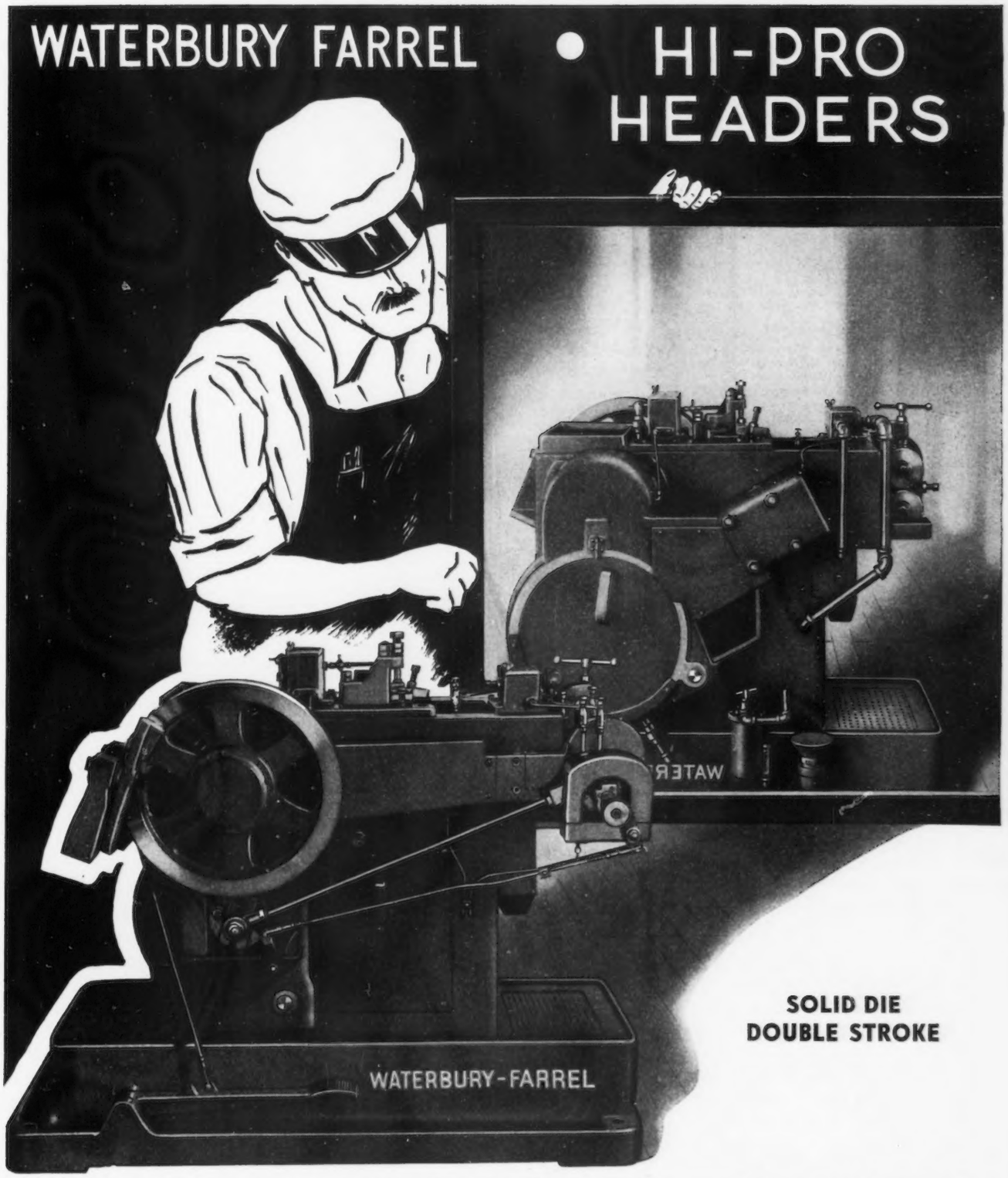
WAREHOUSE PRICES

(Base Prices, Dollars per 100 lb., Delivered Metropolitan Areas)

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St. Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.15	$3.05	$3.15	$3.35	$3.38	$3.23	$3.05	$3.51	$3.45	$3.18	$3.30	$3.48	$4.10
Sheets, cold rolled	....	4.10	4.05	4.05	4.40	4.30	4.30	4.58	....	4.12	4.35	4.43	6.30
Sheets, galvanized	4.75	4.60	4.42	4.50	4.30	4.64	4.45	4.66	4.75	4.95	5.00	4.98	5.25
Strip, hot rolled	3.40	3.40	3.30	3.75	3.76	3.48*	3.62	3.86	3.70	3.52	3.65	3.73	....
Strip, cold rolled	3.20	3.30	3.20	3.31	3.31	3.20	3.22	3.26	....	3.41	3.63	3.54	....
Plates	3.40	3.55	3.40	3.55	3.76	3.60	3.62	3.85	3.35	3.47	3.80	3.68	4.00
Structural shapes	3.40	3.55	3.58	3.55	3.75	3.65	3.40	3.85	3.55	3.47	3.80	3.68	4.00
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.62	3.75	3.63	4.15
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.30	7.31	7.35	7.42	7.10	7.50	....	7.47	7.45	7.33	9.40
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.15	8.56	8.59	8.45	8.15	8.63	....	8.52	8.84	8.38	10.65
Bars, cd. drn. SAE 3100	6.75	6.75	6.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	9.80

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb.; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 150 to 499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 150 to 1049 lb. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.23.

WATERBURY FARREL • HI-PRO HEADERS



SOLID DIE DOUBLE STROKE

For cold-heading rivet and screw blanks—These modern machines are designed to meet the present day demands for high speed, large quantity production, and economical operation—Two standard sizes: 3/16" by 1" at 225 per minute; 5/16" x 1½" at 175 per minute.

WATERBURY FARREL FOUNDRY AND MACHINE COMPANY

WATERBURY, CONNECTICUT

CLEVELAND **CHICAGO** **NEWARK, N. J.**

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic

● **Standard Oil Co. of New Jersey, Inc.,** 26 Broadway, New York, has approved plans for eight new tank units and auxiliary equipment at refinery at Linden, N. J.; also will build two one-story additions at same plant, including extension in process laboratory. Cost over $80,000 with equipment. Contract has been let to Arthur G. McKee & Co., Cleveland, for two steel pipe stills at Clifton, N. J., properties, in connection with expansion there.

Calvert Distillers Corp., 405 Lexington Avenue, New York, has asked bids on general contract for one-story kettle house at branch plant at Relay, Md. Cost over $45,000 with equipment. This is part of expansion program at same plant, previously announced, including four-story extension for storage and distribution, for which general contract has been let to Consolidated Engineering Co., Baltimore. Cost about $85,000 with equipment.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until July 1 for adjustable round split carbon steel dies (Circular 722).

Texas Co., 135 East Forty-second Street, New York, has leased about six acres at TVA waterfront property Guntersville, Ala., for new bulk oil terminal to handle barge shipments. It will include steel storage tanks, pumping station and other facilities. Cost over $80,000 with equipment. This will be one of several such storage and distributing plants to be located in that district, previously noted, including Chattanooga and Nashville, Tenn., and Sheffield, Ala.

Devoe & Raynolds Co., Inc., 1 West Forty-seventh Street, New York, paints, varnishes, oils, etc., has leased five-story building at First Avenue and Forty-fourth Street, 62,500 sq. ft. floor space, for storage and distribution, with company headquarters.

Climax Molybdenum Co., 500 Fifth Avenue, New York, has let general contract to Rust Engineering Co., Clark Building, Pittsburgh, for one-story addition to plant at Langeloth, Pa., 90 x 100 ft. Cost over $65,000 with equipment.

E. R. Squibb & Sons, Inc., 745 Fifth Avenue, New York, drugs and chemicals, has approved plans for seven and 13-story addition to plant at 34-42 Columbia Heights, Brooklyn, 83 x 142 ft., for expansion in manufacturing, storage and distributing departments. Cost close to $600,000 with equipment. Abbott, Merkt & Co., 10 East Fortieth Street, New York, are engineers.

American Cyanamid & Chemical Co., 30 Rockefeller Plaza, New York, has let general contract to Miller-Davis Co., Kalamazoo, Mich., for one and two-story addition to branch plant at Kalamazoo, 65 x 250 ft. Cost over $100,000 with equipment.

Campbell Soup Co., Inc., Front Street, Camden, N. J., has let general contract to Thomas F. Gibson, Commercial Trust Building, Philadelphia, for seven-story addition. Cost over $350,000 with equipment.

Campbell Co., Hicks Avenue, Newton, N. J., photographic papers, etc., has asked bids on general contract for new one and two-story and basement paper processing and sensitizing plant, 65 x 250 ft. Cost close to $85,000 with equipment.

Public Works Officer, Navy Yard, Philadelphia, has let general contract to Day & Zimmerman, Inc., Packard Building, for extensions in shipway No. 3 (Specifications 9825).

Stoner Beverage Co., Tenth and Hanna Streets, Harrisburg, Pa., plans new one and two-story mechanical-bottling, storage and distributing plant, 80 x 100 ft., at Thirteenth and Paxton Streets, with service, repair and garage unit in rear. Cost close to $100,000 with equipment. F. C. Class, Eighteenth and Mulberry Streets, is architect and engineer.

Piper Aircraft Corp., Loch Haven, Pa., plans three additions to plant, comprising two one-story units, each about 50 x 400 ft., for expansion in assembling department, and adjoining one-story structure, 48 x 100 ft. Cost over $100,000 with equipment. Hunting, Davis & Dunnells, Century Building, Pittsburgh, are architects and engineers.

New England

● **Waterbury Tool Co.,** Waterbury, Conn., hydraulic transmissions, gears, pumps, etc., has let contract to Austin Co., Cleveland, for design and erection of one-story addition, about 23,000 sq. ft. floor space. Cost over $65,000 with equipment. Company is affiliated with Vickers, Inc., Detroit, manufacturer of similar equipment, which recently let contract to same company for one-story addition, to cost close to $450,000 with equipment.

United States Engineer Office, Providence, R. I., asks bids until July 12 for equipment for new pumping plant at Call Street terminus, Chicopee, Mass., including three 36-in., vertical, single-stage, propeller-type pumps, with discharge piping, couplings and flap valves; three four-cycle, heavy-duty, stationary-type, internal combustion engines, with silencers and exhaust piping, for driving pumping units; three right-angle gear units for connecting pumps and gasoline engines; one 16-in. vertical, mixed-flow, volute-type pump, with electric motor, inlet and discharge piping, gate valves, flap valves, etc.

United Aircraft Corp., Pratt & Whitney Division, 400 Main Street, East Hartford, Conn., aircraft engines and parts, has let general contract to Turner Construction Co., 420 Lexington Avenue, New York, for two one-story additions for parts production and assembling departments. Cost close to $8,000,000 with machinery. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

Washington District

● **Constructing Quartermaster,** Holabird Quartermaster Depot, Baltimore, asks bids until July 9 for shop building and ordnance school unit at Aberdeen Proving Grounds, Aberdeen, Md. (Circular 6240-59).

American Oil Co., American Building, Baltimore, has let general contract to Philip Vizzini, 3904½ Boarman Avenue, for one-story addition at Curtis Bay bulk terminal, to be used for steel drum reconditioning shop. Cost close to $40,000 with equipment.

Construction Service, Veterans' Administration, Washington, asks bids until July 16 for boiler plant and auxiliary equipment, in conjunction with group of buildings for institution at Marion, Ill., for which bids are being asked at same time; also for one-story incinerator building, one-story equipment storage and distributing building, service and garage building, 250,000-gal. elevated steel tank and tower, air-conditioning plant and other equipment.

Ordnance Bureau, Army Department, Washington, is securing fund of $63,028,370, through new defense appropriation bill, for production of ordnance during fiscal year ending June 30, 1941, with certain amount of fund for expansion and production at privately-owned plants of this character.

Buffalo District

● **Swanson Machine Co.,** 59 Hopkins Avenue, Jamestown, N. Y., machinery and parts, has acquired former plant of Spicer Mfg. Co., Falconer, N. Y., consisting of a one, two and three-story building, and will remodel for new works. Cost over $50,000 with equipment.

Harry Fox & Co., 70 Terrace Street, Buffalo, scrap metals, has purchased former two-story building, 100 x 150 ft., of Dold Packing Co., about 25,000 sq. ft. floor space, for new storage and distributing plant; about one-half acre adioining also has been secured for storage. Company will remove from present building to new location.

Camillus Cutlery Co., Camillus, N. Y., has let general contract to J. D. Taylor Construction Co., 115 South Salina Street, Syracuse, N. Y., for two-story and basement addition, 60 x 120 ft. Cost about $50,000 with equipment. George W. Ketchum, Clinton Square Building, Syracuse, is architect and engineer.

South Atlantic

● **Bureau of Yards and Docks,** Navy Department, Washington, is securing fund of about $3,500,000 in new Navy air base appropriation bill for station at Opa-Locka, near Miami, Fla., including hangars, with shop and reconditioning facilities, $675,000; one-story storehouse and equipment, $100,000; one-story machine and mechanical shops, $130,000 with equipment; warm-up engine platform and facilities, $155,000; gasoline storage and distribution, with pumping units, $100,000; cold storage plant and laundry, $100,000; power plant and equipment, $150,000; radio buildings and towers, $50,000; water supply and distribution system, $300,000; ammunition magazine, $50,000, and other structures.

Shelby Coca-Cola Bottling Co., Shelby, N. C., is arranging immediate call for bids on general contract for one-story mechanical-bottling, storage and distributing plant. Cost over $50,000 with equipment. Jesse M. Shelton, Bona Allen Building, Atlanta, Ga., is architect.

South Central

● **Goodyear Tire & Rubber Co.,** Akron, Ohio, has let general contract to A. K. Adams Co., Atlanta, Ga., for one-story addition to branch mill at Gadsden, Ala. Cost close to $180,000 with equipment.

Independent Mill & Gin Co., Alexandria, La., recently organized by C. L. Hayne, Alexandria, and associates, has approved plans for new cottonseed oil mill, comprising four one-story buildings, 45 x 200 ft., for main unit; 60 x 200 ft., for seedhouse and raw material service; 45 x 100 ft. and 20 x 100 ft., for storage and distribution. Cost over $75,000 with equipment.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until July 1 for radial steel spillway gates for Watts Bar power dam.

Coca-Cola Bottling Co., 1538 Bank Street, Louisville, will take bids at once on general contract for new two-story and basement mechanical-bottling, storage and distributing plant, 200 x 250 ft., at Seventeenth and Hill Streets, with service and garage extension. Cost close to $100,000 with equipment. Jesse M. Shelton, Bona Allen Building, Atlanta, Ga., is architect.

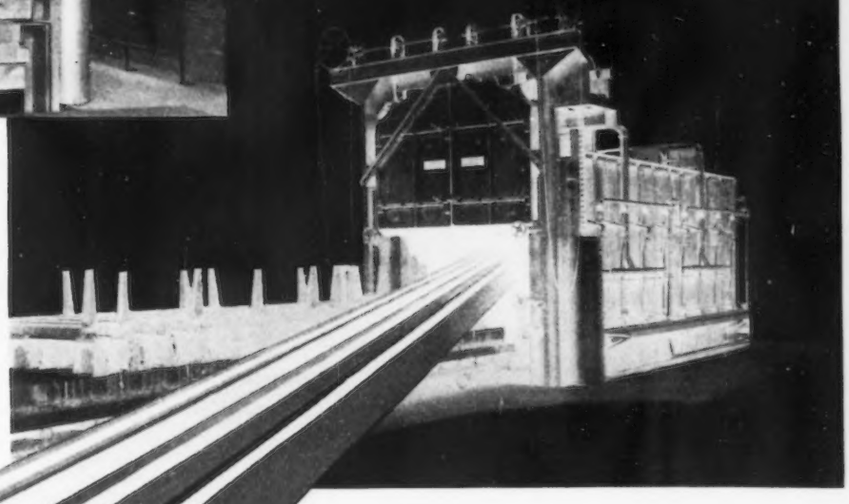
Southwest

● **Carter Carburetor Corp.,** 2840 North Spring Street, St. Louis, plans one-story addition. Cost close to $200,000 with equipment. Company is a subsidiary of American Car & Foundry Co., New York.

Chicago & Southern Air Lines, Inc., Lambert Field, St. Louis, has arranged with city

IF IMPROVED { Machinability / Uniformity / Physicals or / Structure } IS REQUIRED specify . . .

B ANNEALED BAR STEELS



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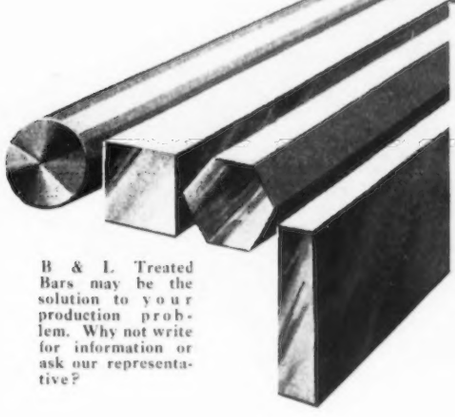

B & L Treated Bars may be the solution to your production problem. Why not write for information or ask our representative?

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Your problem is always a welcome task for B & L engineers. They will study every angle of your production, and then supply the proper Cold Finished Steel . . . developed to your specifications by Annealing, Normalizing, Spheroidizing or Strain Annealing.

This assures desired grain structure and physical character of the bar for improving machinability or increasing ductility and toughness. With B & L treated Bar Steels, you can simplify or even possibly eliminate your own heat treating operations. This will enable you to reduce your production costs and maintain a uniform high quality in your products.

COLD DRAWN BARS · GROUND SHAFTING · LEADED STEELS · SCREW STOCK · ALLOY STEELS

BLISS & LAUGHLIN, INC.

HARVEY, ILL. Sales Offices in All Principal Cities BUFFALO, N. Y.

officials at Memphis, Tenn., for hangar, mechanical shop and office building at Memphis municipal airport, to be built by municipality and occupied under long-term lease. Present plant and headquarters will be removed to new location. Cost about $200,000 complete.

City Council, Raton, N. M., plans extensions and improvements in municipal power plant, including additional equipment. Cost over $50,000 with equipment. E. T. Archer & Co., New England Building, Kansas City, Mo., are consulting engineers.

City Council, Nevada, Mo., has called special election July 2 to vote bonds for $500,000, fund to be used for new municipal power plant, using diesel engine-generating units of about 1500-kw. capacity, and auxiliary equipment, with electrical distribution system. William Spann, Interstate Building, Kansas City, Mo., is consulting engineer.

B. A. Riesner & Son Co., 14 Travis Street, Houston, Tex., steel products, has acquired tract at Clinton Drive West and Lockwood Street, for new plant, consisting of main one-story building for fabricating shop, with lean-to extension for reinforcing steel rod production, and smaller unit for storage and distribution; also one-story office building. Cost over $65,000 with equipment.

Western Pa. District

• **Champion Tool Co.,** Meadville, Pa., has let general contract to Henry Shenk Co., Sassafras Street, Erie, Pa., for two one-story additions, 50 x 140 ft., and 40 x 45 ft., respectively. Cost over $60,000 with equipment.

Westinghouse Electric & Mfg. Co., East Pittsburgh, has let general contract to Consolidated Engineering Co., 20 East Franklin Street, Baltimore, for one-story storage and distributing building at Haven and Foster Avenues, Baltimore, in conjunction with factory branch at Calvert and Lombard Streets. Cost close to $50,000 with equipment.

Raymond Mfg. Co., South Centre Street, Corry, Pa., division of Associated Spring Corp., Bristol, Conn., steel springs, etc., has approved plans for one-story addition. Cost about $45,000 with equipment.

Ohio and Indiana

• **Apex Machine & Tool Co.,** 501 East Third Street, Dayton, Ohio, universal joints, socket wrenches, power bits, etc., will take bids soon on general contract for new one-story plant, about 23,000 sq. ft. floor space, on South Patterson Boulevard. Cost over $60,000 with equipment. Geyer & Neuffer, Ludlow Arcade Building, are architects.

Taylorcraft Aviation Corp., Alliance, Ohio, airplanes and parts, plans expansion to increase rated output from 1000 to 2000 airplanes per annum, including one-story extension for parts production and assembling, and expansion in landing field and facilities. Financing is being arranged through a preferred stock issue.

Clark Controller Co., 1146 East 152nd Street, Cleveland, electric controllers and other electrical equipment, has let general contract to J. L. Hunting Co., East Ninth Street and Chester Avenue, for two one-story additions, 35 x 200 ft., and 35 x 100 ft., respectively. Cost over $85,000 with equipment. Wallace H. Hatch, Hippodrome Annex, is architect.

Constructing Quartermaster, Wright Field, Dayton, Ohio, asks bids until July 2 for one-story addition to engineering shop, one-story equipment repair building, one-story engine test building and spray pool, and airplane repair dock at Patterson Field, Ohio (Circular 6159-25).

East Ohio Gas Co., 1405 East Sixth Street, Cleveland, has approved plans for addition for conversion and storage of natural gas in liquid state, and later re-gassification for transmission through local pipe lines. Plant will operate under a special process, recently perfected. Cost about $1,000,000 with equipment.

Republic Steel Corp., Cleveland, and 800 Circle Tower, Indianapolis, has asked bids on general contract for one-story factory branch, storage and distributing warehouse, 100 x 120 ft., on West Indianapolis Street, Indianapolis. Cost over $75,000 with equipment. J. Edwin Kopf, Indiana Pythian Building, Indianapolis, is architect.

Michigan District

• **Chelsea Spring Co.,** Chelsea, Mich., steel springs for automobiles, etc., has let general contract to O. W. Burke Co., Fisher Building, Detroit, for one-story addition, including expansion in power house. Cost close to $80,000 with equipment. Christian W. Brandt, Eaton Tower Building, Detroit, is architect.

Chrysler Corp., 341 Massachusetts Avenue, Detroit, will take bids soon on general contract for one-story addition, 400 x 1000 ft., to plant at Highland Park, Mich., for expansion in assembling department. Cost over $800,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect.

Royal Coach Co., Elkhart, Ind., trailer coaches, parts, etc., has leased two floors in building of Hastings Table Co., Hastings, Mich., for new plant, including assembling department.

John Crowley Boiler Works, Jackson, Mich., boilers, tanks and other plate products, plans one-story addition. Cost close to $40,000 with equipment. Frost & Snyder, Jackson, are architects.

Middle West

• **Chicago Metal Hose Corp.,** 1315 South Third Avenue, Maywood, Chicago, plans one-story addition. Cost close to $45,000 with equipment. Hallberg & Beersman, 221 North LaSalle Street, Chicago, are architects.

Barber-Colman Co., 150 Loomis Street, Rockford, Ill., reamers, hobbing machines and other cutting tools, special machinery and parts, has let general contract to Anderson Brothers, 219 Fifteenth Avenue, for one-story addition, 170 x 175 ft. Cost over $100,000 with equipment.

Cudahy Packing Co., 221 North La Salle Street, Chicago, meat packer, has let general contract to Philip McArdle, 526 South Fifty-first Avenue, Omaha, Neb., for five-story addition to meat-processing and packing plant at Omaha. Cost over $175,000 with equipment.

Star Valley Power & Light Co., Afton, Wyo., has secured permission to build hydro-electric power plant on Swift Creek in Wyoming National Forest, with transmission line to Afton and vicinity. Work will begin soon.

Northern Pump Co., 920 Eighteenth Avenue, N.E., Minneapolis, has let general contract to George F. Cook Construction Co., 4640 Colfax Avenue South, for one-story addition, 91 x 198 ft., to be used as a machine shop. Cost about $45,000 with equipment.

Giddings & Lewis Machine Tool Co., 142 Doty Street, Fond du Lac, Wis., will take bids at once for one-story addition, 44 x 120 ft.; also for one and two-story L-shaped office and operating building, 140 x 160 ft. Cost over $85,000 with equipment. F. J. Stepnoski & Son, 104 South Main Street, are architects.

Pacific Coast

• **Harvill Aircraft Die-Casting Corp.,** 2344 East Thirty-eighth Street, Vernon, Los Angeles, has let general contract to Austin Co., 777 East Washington Boulevard, for design and construction of new one-story plant, about 52,000 sq. ft. floor space, at Los Angeles municipal airport. Cost close to $100,000 with equipment.

California Packing Corp., 101 California Street, San Francisco, food canner and packer, has asked bids on general contract for one-story addition to branch plant at Monterey, Cal. Cost close to $45,000 with equipment.

Hammel Heating Co., Inc., 1366 Motor Avenue, Los Angeles, heating equipment, plans one-story addition, 50 x 114 ft., for storage and distribution. Cost close to $40,000 with equipment. Benjamin Wiseman, 5927 Franklin Avenue, Hollywood, Cal., is architect.

Universal Aircraft Corp., Concrete, Wash., care of P. F. Miller, Concrete, president, recently organized by Mr. Miller and associates with capital of $1,000,000, has acquired plant and business of Stearman-Hammond Aircraft Corp., Oakland, Cal., and will remove to Puget Sound, Wash., district, where new aircraft plant will be operated. Company is considering sites at new Snohomish airport, near Everett, Wash. Plant will consist of several one-story units for parts production and assembling. Cost close to $350,000 with equipment. D. A. Duryea and J. A. Norway, First National Bank, Everett, and S. Frank Spencer, mayor of Everett, are interested in project.

Constructing Quartermaster, Hill Field, Ogden, Utah, asks bids until July 9 for new steel hangar and annex buildings for shop and operating service, and complete utilities.

Canada

• **Canadian Johns-Manville Co., Ltd.,** Sun Life Building, Montreal, building products, plans two two-story additions at raw material plant at Asbestos, Que., 130 x 320 ft., for general production, and 75 x 95 ft., for storage and distribution. Cost over $100,000 with equipment.

Fairchild Aircraft Mfg. Co., Ltd., Longeuil, Que., has let general contract to Sutherland Construction Co., Ltd., 485 McGill Street, Montreal, for one-story addition for expansion in parts production and assembling divisions. Cost over $85,000 with equipment.

St. Johns, Que., Homisdas Morais, City Hall, secretary-treasurer, has plans for a pumping station at Market Place to cost $50,000.

Singer Sewing Machine Co., Ltd., 195 Sparks Street, Ottawa, has awarded contract to A. F. Byers & Co., Ltd., 1226 University Avenue, Montreal, for plant addition at Thurso, Que., to cost $60,000.

Davie Shipbuilding & Repairing Co., Ltd., 25 David Street, Lauzon, Que., has awarded contract to Komo Construction, Ltd., 812 St. Vallier Street, Quebec, for addition to cost $40,000. Hutchison & Wood, 204 Notre Dame Street West, Montreal, are architects.

De Haviland Aircraft of Canada, Ltd., Toronto, cooperating with Department of Munitions and Supply, has awarded contract to A. W. Robertson Ltd., 57 Bloor Street West, for first unit of expansion program in North York Township. Clare G. MacLean, 9 Sultan Street, Toronto, is architect; Edgar A. Cross, 991 Bloor Street West, Toronto, is engineer.

Continental Can Co. of Canada, Ltd., New Toronto, Ont., has placed several sub-trades in connection with $250,000 plant addition for which Foundation Co. of Canada, Ltd., 1158 Bay Street, Toronto, has general contract.

Dominion Department Public Works, Ottawa, has awarded contract to Fundy Construction Co., Ltd., Halifax, N. S., for ordnance building at dockyard, Halifax, to cost $265,000.

Dominion Engineering Works, Ltd., First Avenue, Lachine, Que., has called tenders for construction of tool room 40 x 240 feet.

Atlas Engineering & Machine Co., Ltd., 28 Eastern Avenue, Toronto, is receiving tenders through architect, W. L. Somerville, 30 Bloor Street West, for plant addition, 50 x 166 ft. Equipment will be purchased later.

Canadian Car & Foundry Co., Ltd., Fort William, Ont., has awarded contract to Claydon Co., Ltd., Graham Horne Boulevard, for $50,000 plant addition at Fort William.

JUNE 27, 1940

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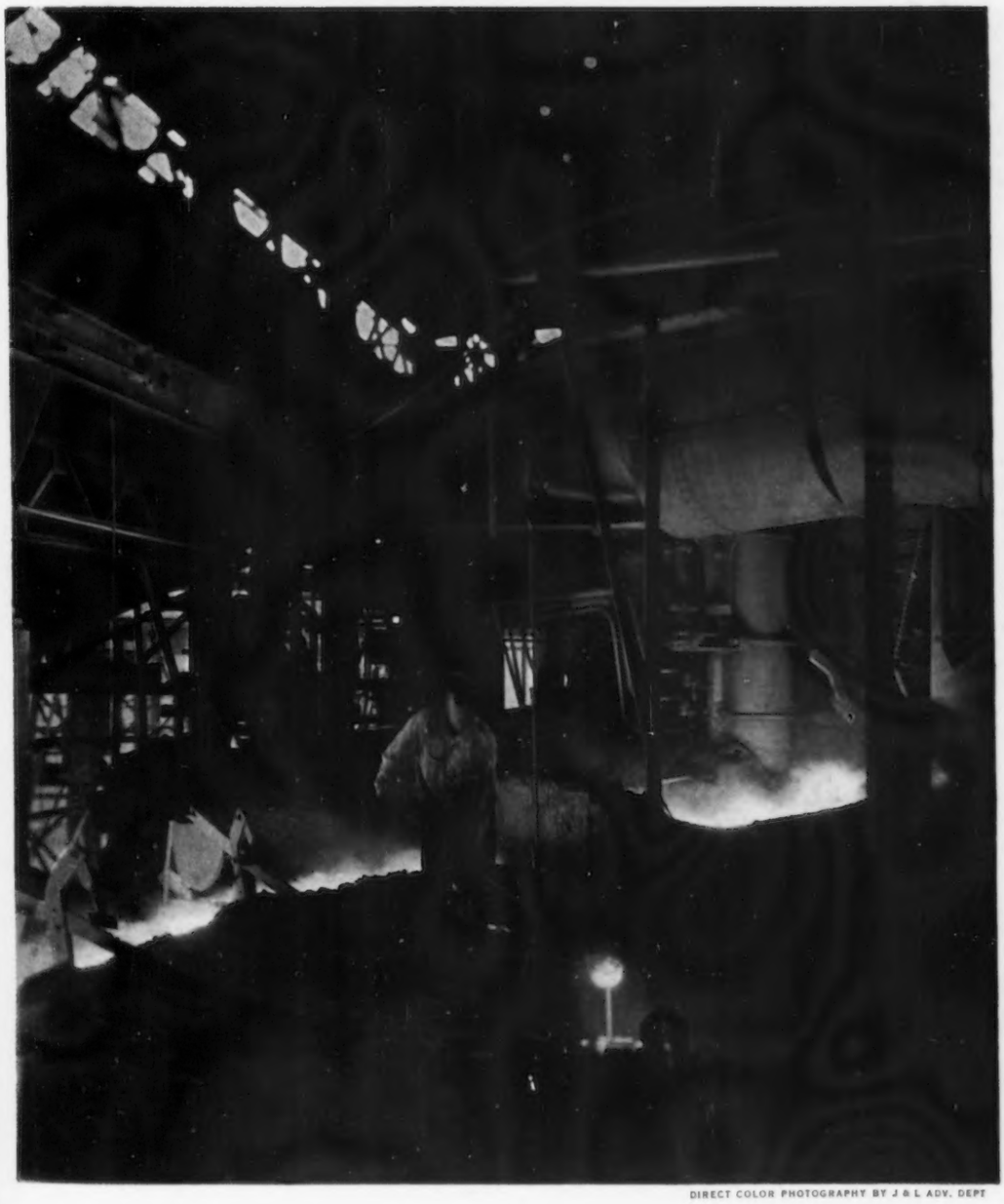
THE IRON AGE

JUN 27 1940



DIRECT COLOR PHOTOGRAPHY BY J & L ADV. DEPT

TWO POUNDS OF J & L IRON PROVE THE QUALITY OF 200 TONS

J & L skilled blast furnace operators take test specimens of molten iron for analysis in a J & L quality control laboratory.

BETTER
WORKING STEEL
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Practical skill and laborato
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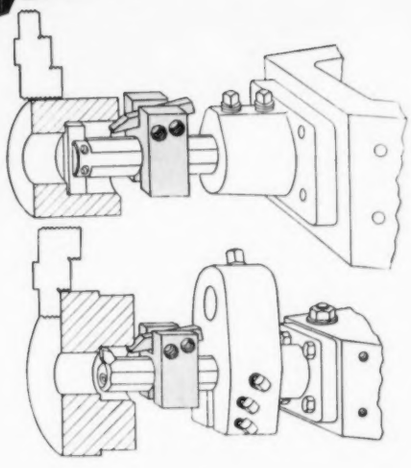
J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION • AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

How is YOUR Stock of STUB BORING BARS and CUTTER HEADS?



Every hole must be chamfered. Do it with a cutter head on the same stub boring bar that bores the hole.

Save set-up time, indexing time and production time with the new Warner and Swasey combination of improved boring bars and cutter heads.

You can do rough or finish boring with these stub boring bars held in slide tools, multiple turning heads, tool holders or turret holes. Screws in the hardened and ground bars hold and adjust the cutter.

To chamfer holes, note above how the addition of the cutter head eliminates a second tool or a second operation. The heads clamp to the boring bar and are reversible and adjustable to permit a wide range of diameters to be chamfered.

MAIL YOUR ORDER

for a set of Angular Cutter Stub Boring Bars with Cutter Heads. Prices listed for your convenience on sizes and combinations, are F.O.B. Cleveland. Specify tool numbers when ordering.

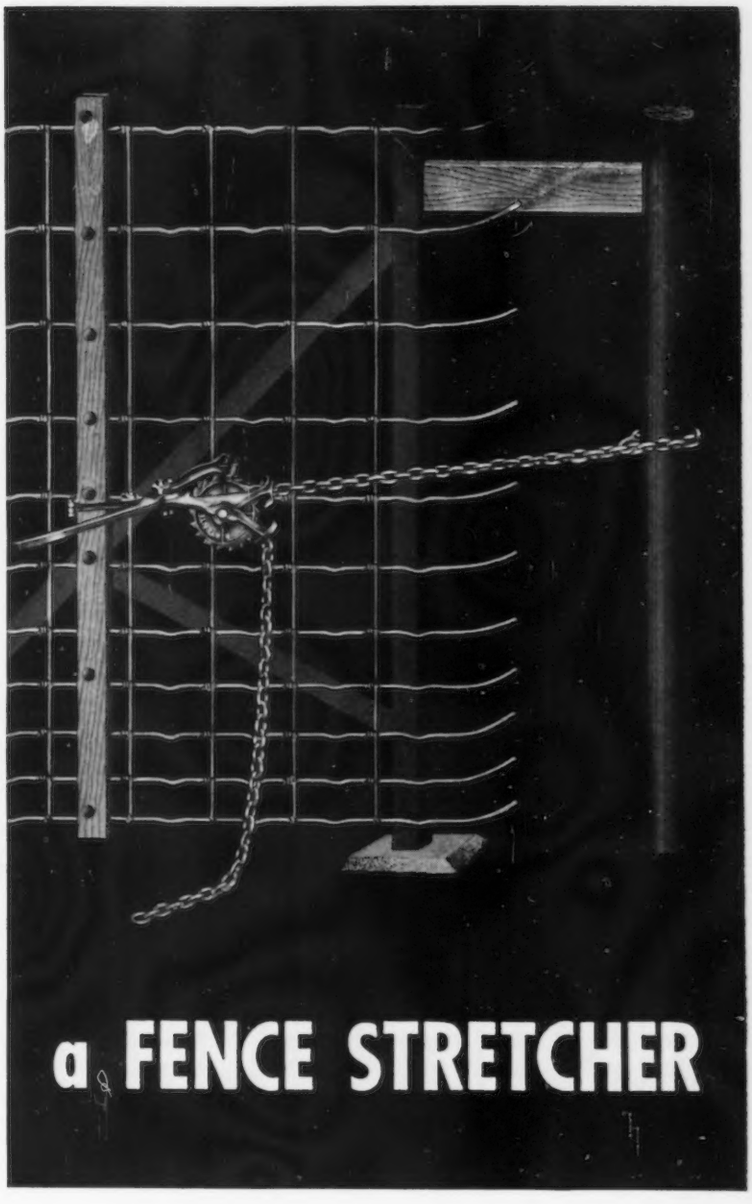
Tool No. Bars	Tool No. Heads	Bar Size	Combined Price	
M-1760	M-1780	½"	$11.00	Set "A" $84.50
M-1761	M-1781	¾"	13.00	
M-1762	M-1782	1"	16.50	
M-1763	M-1783	1¼"	20.50	
M-1764	M-1784	1½"	23.50	
M-1765	M-1785	1¾"	27.00	Set "B" $144.00
M-1766	M-1786	2"	33.00	
M-1767	M-1787	2½"	39.00	
M-1768	M-1788	3"	45.00	

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH WARNER & SWASEY TOOLS

YES...

there really is a FENCE STRETCHER



Bethlehem does not confuse fence-stretchers with the legendary pie-stretchers and left-hand monkey wrenches. We know they exist because we annually furnish a sizable tonnage of steel for the manufacture of these useful tools.

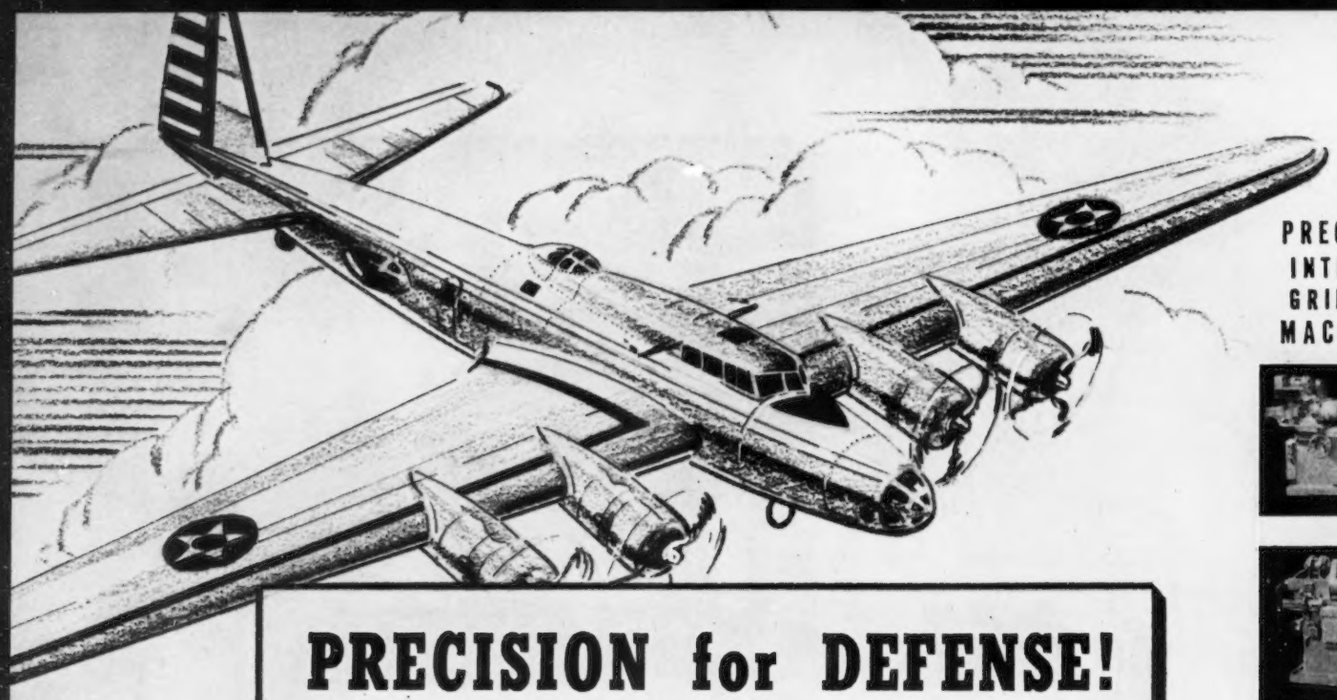
In fact, it is difficult to think of any product made of steel for which Bethlehem has not supplied material and sound advice. Of course, practically all such products use one of a hundred or more standard analyses of steel, produced under one of a dozen or more standard practices. That, however, is not the story. The trick is to know which anlysis and which practice should be used.

Bethlehem knows a good deal about the application of steel to the most specialized problems. If you will put your problems up to us, we can often show how a change in steel, its fabrication or treatment, will give you a better product for the same money or as good a product for less money.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

THE IRON AGE, published every Thursday by the *CHILTON CO. (INC.)*. Publication office, Chestnut & 56th Sts., Philadelphia, Pa. Editorial and Executive Offices, 239 W. 39th St., New York, N. Y. Entered as second class matter November 8, 1932, at the Post Office at Philadelphia under Act of March 3, 1879. $6.00 a year in U. S., Canada, $8.50, Foreign $12.00. Vol. 145, No. 26.



PRECISION for DEFENSE!

No other factor is more vital to a successful national defense program than precision in manufacturing. On precision hinges the performance of practically every unit of defense including such components as gun sights, gyroscopic compasses, rifle mechanisms, instruments, airplane propellers, and all kinds of other devices — some brutes of strength, some extremely delicate and sensitive, but all requiring precision.

To insure high accuracy and finish on this work with minimum scrap and rejections, manufacturers can profitably follow the example of leading American industries in specifying Heald Precision Borizing and Grinding Machines wherever precision is required.

The HEALD MACHINE CO.
WORCESTER MASSACHUSETTS
PRECISION BORING and GRINDING MACHINES

Heald builds a complete line of Precision Boring, Facing and Turning Machines, Internal Grinding Machines and Surface Grinding Machines — Including 34 different styles to meet your needs.

RECISION
BORING
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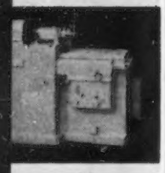
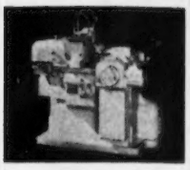
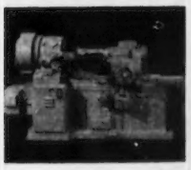
TURNING
ACHINES



PRECISION
INTERNAL
GRINDING
MACHINES





The Case* of CONDENSATE THAT CRIPPLED

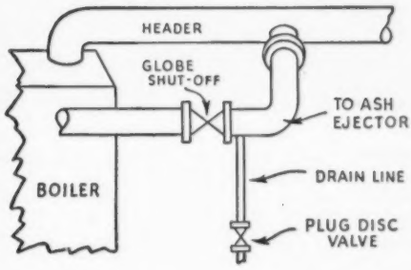
SOLVED WITH PREVENTIVE MAINTENANCE

"I'm sick of this condensate problem!" moaned the BIG BOSS. "Some day it will wreck our plant!"

"That valve seat is cut to pieces," said the ENGINEER, ". . . and we just put it into the line."

"Preventive Maintenance," offered the CRANE REPRESENTATIVE, ". . . with the right equipment should stop the trouble. Let's have a look!"

WE don't know that such conversation ever took place, but it might well have, in view of the facts of the case. In the power plant of a hosiery mill, steam was piped to an ash ejector, direct from the main header. There was some 12 or 14 feet of 2½" pipe between the header and the ejector line shut-off valve, as shown in the sketch below.



As a result, there always was a leg of condensate ahead of the valve. Each time the valve was opened, the severe cutting action of the water traveling at high velocity did serious damage to its seating surfaces.

Ordinary maintenance was useless. This globe valve was everlastingly being repaired or replaced. The Engineer saw that Preventive Maintenance—as suggested by G. W. H., the Crane Man—was necessary. Together they attacked the trouble at its source.

Preventive Maintenance counseled the installation of a small drain line with a Crane plug disc valve through which the condensate could be drained before the globe valve was opened. This was done.

Results: (1) The trouble was entirely eliminated. (2) The life of the globe valve was extended manifold. (3) Another user of piping equipment learned the economy of Preventive Maintenance, and of looking to Crane for the right valves and fittings for every need, common or extraordinary; also, of the wisdom of calling in the Crane Man on every flow control problem.

**This case is based on an actual experience of a Crane Representative in our Indianapolis Branch.*

FOR TOUGH THROTTLING JOBS USE CRANE PLUG DISC VALVES

For throttling and other severe piping jobs at pressures from 150 to 350 pounds steam at 550°F., you can't make a better choice than Crane Brass Plug Disc Valves.

The extra stamina of these Crane valves is in their disc and seat metals—just the right combination for highest resistance to wire-drawing, erosion and corrosion under actual working conditions. The same care in the selection of body materials, sound design, extra strength and perfect balance in every part, result in valves from which you may expect unusual performance.

In services up to 250 pounds steam pressure, this Crane No. 212P will give you dependable, economical flow control—even in the toughest spots in your lines. Available in sizes up to 3 inches.

Ask your Crane Representative about these Plug Disc Valves.

1940 OUR 85th YEAR

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO

VALVES · FITTINGS · PIPE
PLUMBING · HEATING · PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

In so many kinds

DESIGNERS, NOTE!

Broadly speaking, U·S·S COR-TEN can be applied to effect operating economies, to increase strength or to prolong life in practically every kind of equipment that must be moved, or that must lift, support, or move other materials. U·S·S COR-TEN has been used successfully for—

Transportation Equipment

Bus Bodies and Frames
Trackless Trolleys
Truck and Trailer Frames
Truck Bodies (dump and freight)
Tractors

Earth-Moving and Materials-Handling Equipment

Scrapers
Graders
Bulldozers
Cement Mixers
Booms—Hoists
Derricks
Trench Diggers
Steam Shovels
Mine Cars
Rail Dump Cars
Ore Cars
Skips and Cages
Ventilator Ducts
Blowers
Stripping Shovels
Grab Buckets
Drag-line Buckets
Conveyors
Lumber Carriers
Stackers

Marine Applications

Ships
Boats
Barges
Dams and Locks

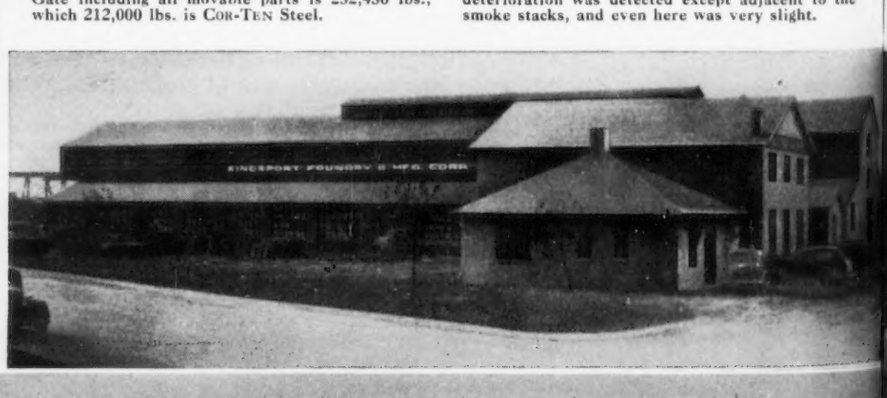
Roofing and Siding

U·S·S COR-TEN is available in all standard forms—plates, shapes, bars, sheet, strip, special cold formed sections and other products. *To get best results with* COR-TEN *it will be helpful to note with your inquiry or order, the purpose and the fabrication procedure contemplated.*

R-TEN BUILDS WORLD'S LARGEST LOGGING TRUCK UNIT. give the maximum strength and stamina with minimum weight, mammoth motor haul unit, built by the Kenworth Motor ck Corporation, uses COR-TEN construction throughout. De- ed to carry a payload of 110,000 lbs., these units will carry 00 ft. of logs per trip at average speeds of 25 miles per hour h full load—a total of about 75,000 ft. of Ponderosa pine per on a haul of 15 miles. Used by the Lakeview Logging Co., eview, Oregon, this truck is hauling 22,140 ft., believed to be est load of logs ever carried by a truck and trailer.

MARINE APPLICATIONS—U·S·S COR-TEN USED IN FLOOD WATER CONTROL. This Tainter Gate, fabricated by R. C. Mahon Company, Detroit, Michigan, is one of fifteen used in a river dam for flood control. These gates are of a special type and are longer than any previously constructed, the length of the drum being 75′ 2½″ face-to-face of end shield plate. Total weight of each Tainter Gate including all movable parts is 232,430 lbs., which 212,000 lbs. is COR-TEN Steel.

COR-TEN ROOF RESISTS SEVERE CORROSIVE CONDITIONS. *(Below)* Applied to the roof of this foundry building where ordinary light gage roofing sheets were rapidly destroyed, COR-TEN has given excellent service. The U·S·S COR-TEN corrugated sheets—hot rolled, annealed, 22-gage—were applied in December 1935, and painted with red oxide of iron paint. When examined almost 3 years later no deterioration was detected except adjacent to the smoke stacks, and even here was very slight.



UNITED STATES STEEL

# of industrial equipment . .

COR-TEN REDUCES DEAD WEIGHT, ADDS STRENGTH, INCREASES RESISTANCE TO CORROSION — *at lowest cost!*

● **Because U·S·S Cor-Ten today costs only 45% more than copper steel—Cor-Ten in most applications adds little or nothing extra to former costs. In mobile equipment, for example, the weight that Cor-Ten construction saves often entirely wipes out any cost differential, or makes it very small indeed.**

● **When used in equipment subject to excessive wear and abrasion, Cor-Ten, due to its superior abrasion resistance, soon pays for itself in terms of longer service.**

● **Or where corrosion resistance is the all-important factor, equipment and structures built of Cor-Ten last so much longer, cost so much less to maintain, that the slight extra cost for Cor-Ten more than justifies itself.**

HUNDREDS of industrial applications made in the six years since Cor-Ten was introduced prove these facts . . . have conclusively demonstrated that it is no longer necessary to pay a high premium for light weight—for increased strength—or greater durability.

U·S·S Cor-Ten is the pioneer low alloy, high tensile steel. It has a yield point of 50,000 lbs. per sq. in.—1½ times that of ordinary structural steel. Its resistance to atmospheric corrosion is 4 to 6 times that of plain steel. Its resistance to abrasion is 1/3 greater. Its modulus of elasticity—resistance to deflection—is almost 3 times that of non-ferrous "light" metals. That is why stress-carrying members of U·S·S Cor-Ten do not have to be thick to be strong, rigid and durable.

Cor-Ten fabricates readily and at low cost. It welds satisfactorily, without the need of stress relieving; can be used in the as-rolled condition without heat treatment. Building with Cor-Ten you can use the same equipment and the same shop crews and, with only minor changes in shop procedure, turn out a perfect job with no increase in time.

Because of the large tonnage of U·S·S Cor-Ten sold to date—and the wide diversity of its many applications, we can place at your disposal a wealth of experience and practical fabrication and design data nowhere else available. We will gladly show you how to apply Cor-Ten most economically and efficiently to your designs.

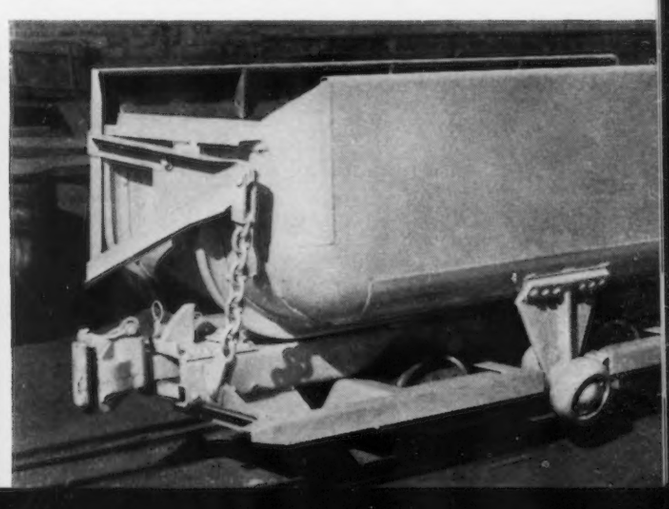
AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

Scully Steel Products Company, Chicago, *Warehouse Distributors* · United States Steel Export Company, New York

USS

U·S·S COR-TEN AND U·S·S MAN-TEN REDUCE WEIGHT AND INCREASE LIFE HERE. In this Smith Mobile truck mixer built by the T. L. Smith Company, Milwaukee, Wisconsin, U·S·S Cor-Ten used in the water tank saves weight and materially increases corrosion resistance. U·S·S Man-Ten used in the mixing drum saves weight and increases life of this vital part by reducing abrasive wear. Additional weight is saved by using Man-Ten in the Z-bars constituting the major portion of the main frame, and in the discharge chute which is now produced from Man-Ten in place of a heavier gage open hearth steel previously used. Here Man-Ten's 1/3 greater abrasion resistance will be of material benefit.

COR-TEN-BUILT MINE CAR FOR HEAVY DUTY SERVICE. This 5-ton Granby-type mine car is one of 40 recently built by the S. C. Card Iron Works Company, Denver, for the Homestake Mining Company, Lead, South Dakota. The mine owners specially specified Cor-Ten for all parts except the castings and the mine rails used for reinforcing the bodies. Most of the Cor-Ten shapes were formed by hydraulic press and the Card Company expressed complete satisfaction with the weldability and working qualities of Cor-Ten.



LONGER LIFE FOR STEEL

THE HIGHER SPEEDS and pressures at which today's steel mill drives are operated have brought the need for lubricants that remain stable and offer greater protection to the gears and bearings.

The Texas Company is supplying specialized lubricants that more than meet the requirements of these modern drives . . . *Texaco Meropa Lubricants.*

After more than 2 years of service testing in various steel plants, *Texaco Meropa Lubricant* is offered for any steel mill service where extreme pressures exist and where emulsification with water must be avoided.

The accompanying letter tells of United's approval of *Texaco Meropa.* This lubricant is being used with entire satisfaction for the lubrication of United drives in many of the country's leading steel mills.

Our engineers will gladly demonstrate *Texaco Meropa Lubricants* in your mill. For this service, phone the nearest of more than 2300 Texaco warehousing points, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

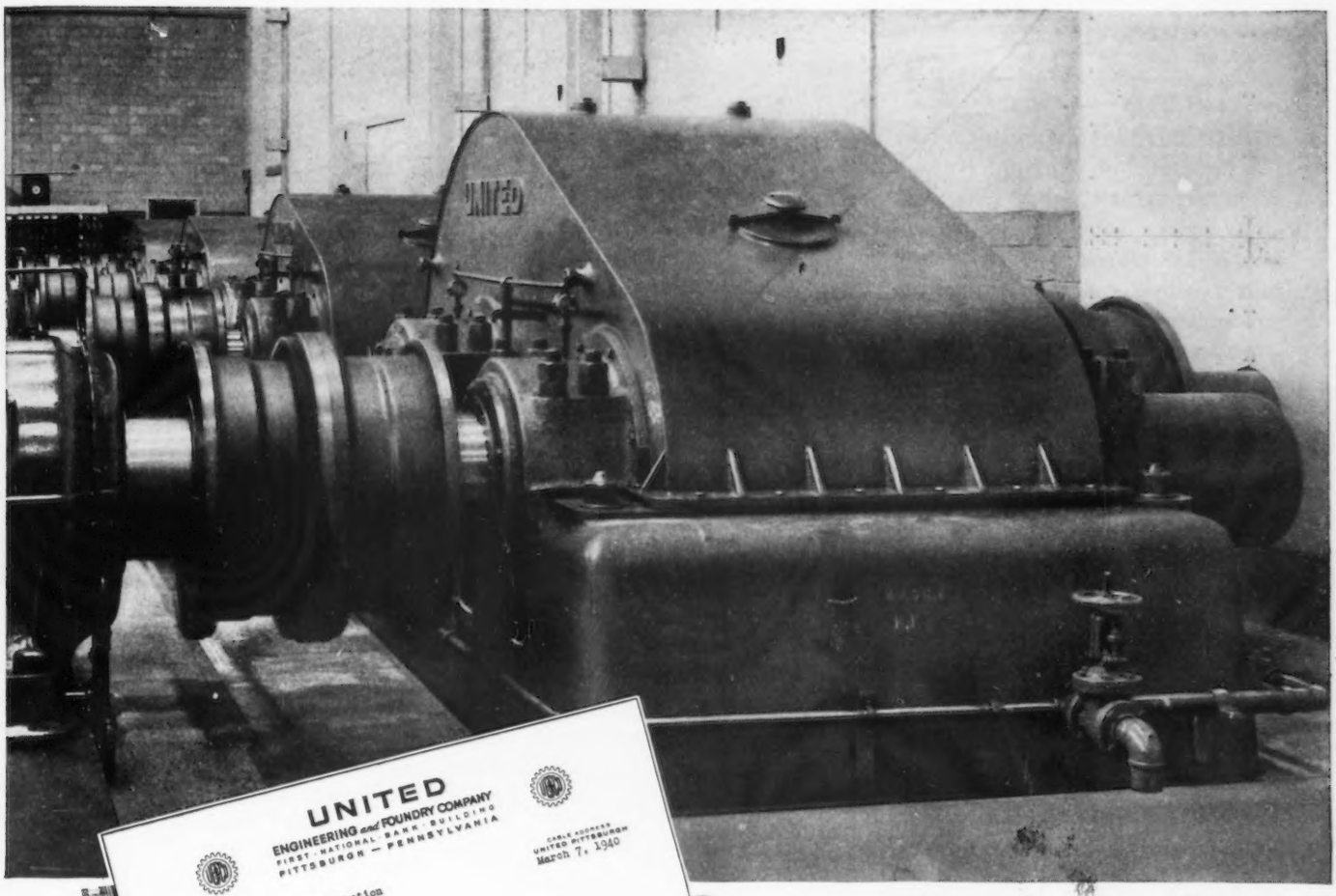
TEXACO MEROPA LUBRICANTS **provide outstanding service for: STEEL MILL DRIVES, EDGER ROLL DRIVES, SCREW DOWNS, COOLING BED GEARS, TABLE ROLLS, TABLE MANIPULATOR GEARS, PEELERS, PLUNGERS FOR HYDRAULIC PUMPS AND ACCUMULATORS.**

Texaco Dealers invite you to tune in The Texaco Star Theatre — a full hour of all-star entertainment — Every Wednesday Night — Columbia Network — 9:00 E.D.T., 8:00 E.S.T., 8:00 C.D.T., 7:00 C.S.T., 6:00 M.S.T., 5:00 P.S.T.

TEXACO REG. T. M.

TEXACO

MILL GEAR DRIVES...



UNITED ENGINEERING & FOUNDRY COMPANY'S drives in prominent steel mill.

UNITED
ENGINEERING and FOUNDRY COMPANY
FIRST NATIONAL BANK BUILDING
PITTSBURGH — PENNSYLVANIA

March 7, 1940

Subject: Mill Machinery Lubrication

The Texas Company
2015 Osgood Street
N.S., Pittsburgh, Pa.

Attention: Mr. P. D. Bowman

Gentlemen:

In reply to your letter of January 6, we will be glad to place your Meropa lubricants on lists recommended by us, where they meet the specifications for the lubricant best adapted to the particular service and operating conditions.

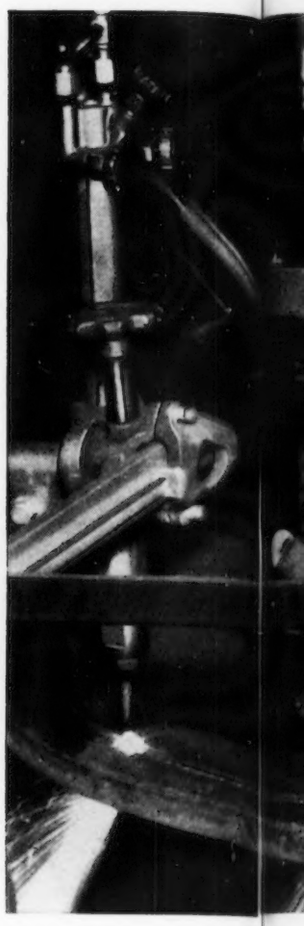
Yours very truly,
UNITED ENGINEERING & FOUNDRY COMPANY
M. P. SIBDEN
CHIEF ENGINEER

MPS:MK

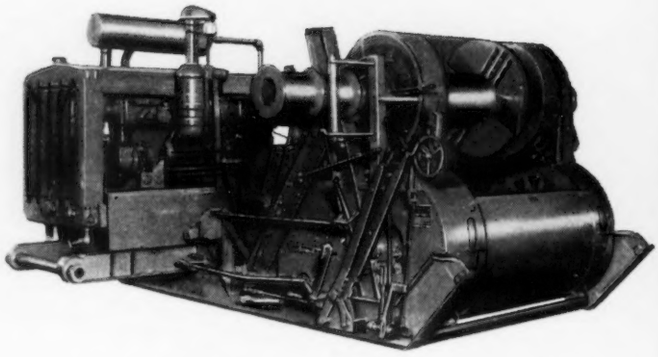
Meropa Lubricants

Read how Linde products and Linde's process ability help this typical Linde customer make better industrial equipment at lower cost!

Linde Lends a Hand



THE Cardwell Manufacturing Company of Wichita, Kansas, manufactures oil well drilling rigs, draw works, winches, line-up dollies, and other widely used oil well and pipe line equipment. In the development of the manufacturing processes which have brought this equipment to its present stage of acceptance, Linde has been privileged to lend a helping hand. This story of how Linde facilities can help improve product design and methods of manufacture, may suggest ways in which you, too, can use them to advantage.



This Double-Drum Draw Works is typical of the oil well equipment manufactured by Cardwell Manufacturing Company. It is fabricated of flame-cut and welded parts—is therefore lighter and stronger.

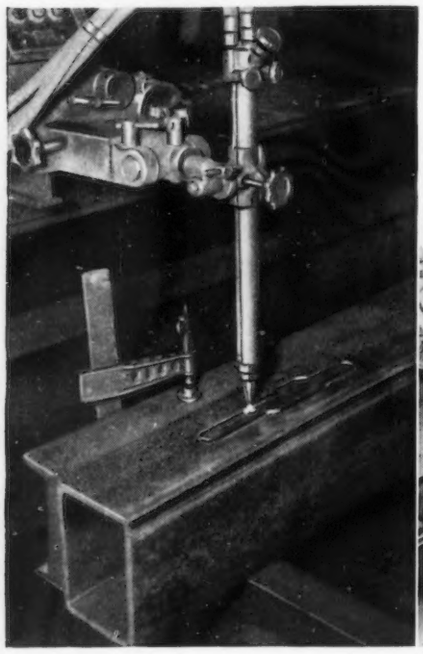
Linde Products Used

Cardwell equipment is fabricated almost entirely of steel parts produced by Oxweld flame-cutting machines, welded into strong, tough units. In addition, Linde Process Service has helped Cardwell engineers develop useful applications of Oxweld apparatus for oxy-acetylene gouging, flame-hardening, hard-surfacing, heating, and hand-cutting.

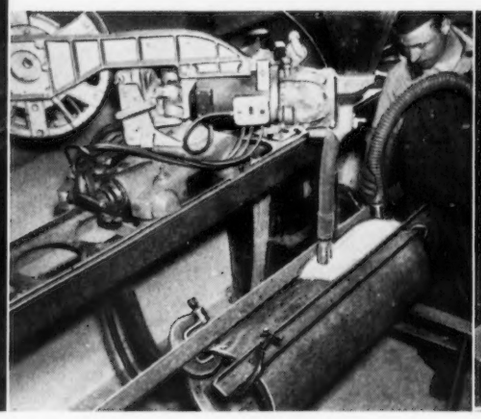
Since these operations are an integral part of the Cardwell manufacturing procedure, maximum convenience and economy are attained by piping Linde Oxygen and acetylene to twenty stations throughout the plant. The acetylene is produced from Union Carbide in Oxweld generators. Linde helped plan and install this system.

How Cardwell Benefits

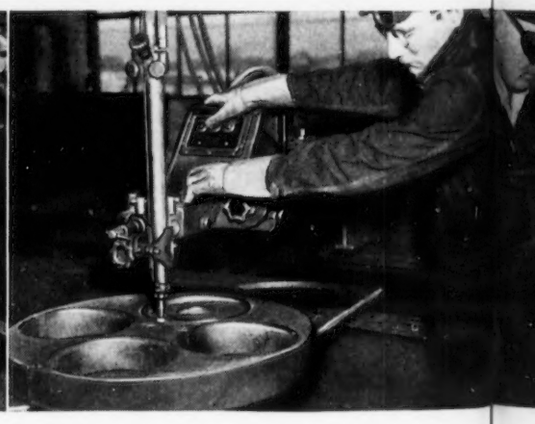
Flame-cutting, welding, and other oxy-acetylene processes have enabled Cardwell to make products



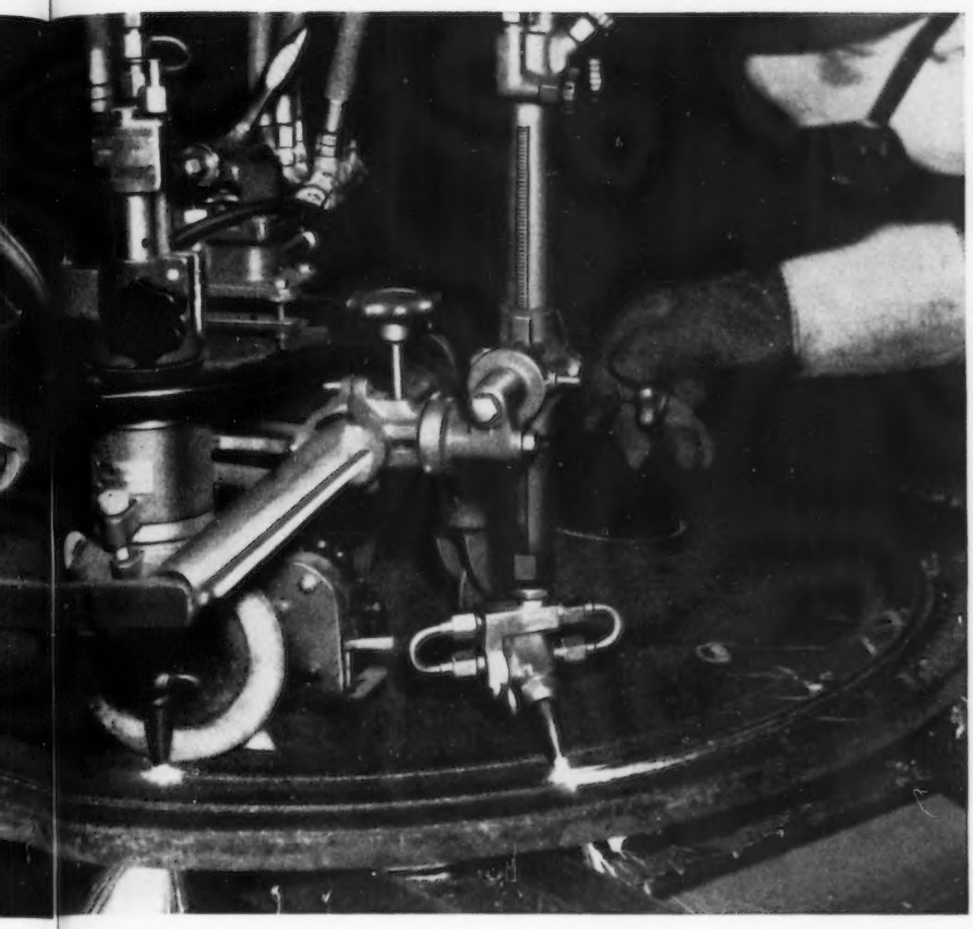
An Oxweld (CM-12) machine flame-cuts slots in a brake-beam. This beam was made by joining two ordinary structural angles by means of Unionmelt welding.



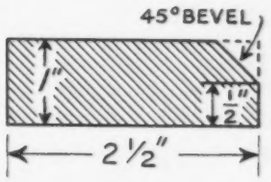
Here Linde's remarkable electric process, Unionmelt welding, bonds in one fast pass —without flash, glare, or sparks — steel plates formed to make a laminated drum.



The CM-12 cuts gear blanks from 2¾-in. plate. Shapes can be cut by hand-tracing, or automatically from templets, using as many as four blowpipes at once.

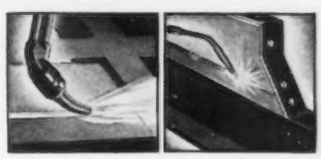


One Operation Saves $2600!

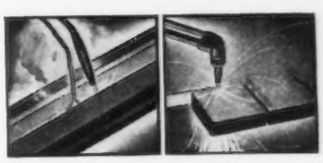


It is estimated that one operation alone (left)—cutting stiffener rings for drum flanges out of 1-in. plate—saves $2,600 yearly over previous methods. One blowpipe cuts the O.D., the second the I.D., and the third cuts a 45-deg. bevel, as shown in the cross section above. The machine is the Oxweld portable CM-16.

Some Other Operations



Gouging ***permits removal of welds or alteration of design.*** **Flame-heating** ***is used for bending, and for straightening warped structures.***



Flame-Hardening ***makes wearing parts last longer.*** **Hand-Cutting** ***produces small parts where machine accuracy is not needed.***

that are light, strong, and modern in appearance. At the same time, they have materially reduced manufacturing costs. Because these methods of fabrication make rapid one-of-a-kind production of any desired part economically practical, inventory stocks can be held down — yet prompt deliveries can be assured.

Another advantage of these flexible processes is that they permit constant change and improvement in product design—without loss of time or money for preparation of new dies, molds, or patterns.

Linde Has Process Ability

Linde Process Service takes many forms. It includes service operators, engineering consultation, research co-operation, process movies, how-to-do-it literature, and the monthly magazine, *OXY-ACETYLENE TIPS.* But whatever the form of service extended, it is based on Linde's "process ability" and it helps customers use Linde products *profitably.*

Linde Can Help You

It pays to standardize on Linde products. It pays in terms of good gases and apparatus, in prompt deliveries, in simplified bookkeeping and cylinder handling, in reduced stocks of apparatus parts, and in money-saving processes and service.

If you would like to know more about the processes shown here, and about Linde's facilities for helping you use them effectively, ask Linde.

The Oxweld CM-15 is shown cutting two identical parts from 3/8-in. plate. This machine can do many of the things the CM-12 can do, but within a smaller range.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

General Office: New York, N. Y. UCC Offices in Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

LINDE OXYGEN • PREST-O-LITE ACETYLENE • UNION CARBIDE • OXWELD, PUROX, AND PREST-O-WELD APPARATUS • OXWELD SUPPLIES • UNIONMELT WELDING

The words "Linde," "Prest-O-Lite," "Union," "Oxweld," "Purox," "Prest-O-Weld," "Carbic," and "Unionmelt" are trade-marks of Units of Union Carbide and Carbon Corporation.

Bi-Metal

Ask Your Westinghouse Representative For This Bi-Metal Demonstration

Make This Test Yourself... A strip of Bi-Metal and a match are all you need to prove to yourself the time and moneysaving advantages of Bi-Metal Protection. Ask your Westinghouse Representative for Bi-Metal Demonstration Kit.

HERE'S HOW BI-METAL SAVES MONEY ... GIVES BETTER PROTECTION

Two different metals bonded together, when heated always bend in the same direction. The heat from short circuit or continued overload currents causes the Bi-Metal, which is exactly calibrated to the job at the factory, to act and open the circuit. Because of Bi-Metal's characteristics, its accuracy never changes, regardless of the number of operations. There's nothing to replace ... nothing to wear out.

...U PAY NO MORE FOR BI-METAL PROTECTION IN THIS WESTINGHOUSE EQUIPMENT

← **THERMOGUARD MOTOR**

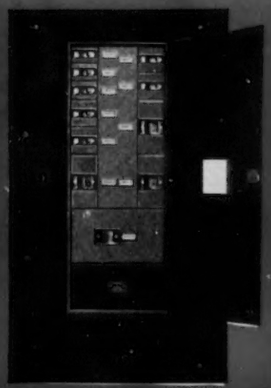
Single-phase sizes up through 2 hp. Impossible to burn out. Accurate Bi-Metal protection.

NOFUZE CIRCUIT BREAKER →

Bi-Metal eliminates fuses. "De-ion" arc quenchers save contacts. Operates with cabinet closed. Safety interlock.

→ **LIGHTING AND POWER PANELBOARDS**

Bi-Metal protects circuits. Eliminates fuses. "De-ion" arc quenchers save contacts.



Westinghouse

W
WESTINGHOUSE ELECTRIC

GIVES MOST ACCURATE PROTECTION

"DE-ION" MOTOR WATCHMAN
A manual motor starter for motors up to 7½ hp.

ORIGINAL CALIBRATION UNCHANGED BY REPEATED OPERATION OF THIS MANUAL STARTER

To get dependable, consistent motor overload protection, be sure you get Bi-Metal protection in your motor starter.

The Bi-Metal relay is accurately calibrated at the factory. It maintains this accuracy unchanged even after repeated operation. Before the heat of an unsafe overload can damage motor windings, the Bi-Metal operates automatically to disconnect the motor from the line. There is nothing to renew or replace. You save time, trouble and money.

PLUS THESE MONEYSAVING FEATURES

Indicating handle shows clearly whether starter is "on," "off," or "tripped." Safety interlock prevents accidental contact with live parts. Double break silver contacts give quick-make, quick-break.

"DE-ION" ARC QUENCHERS AT NO EXTRA COST

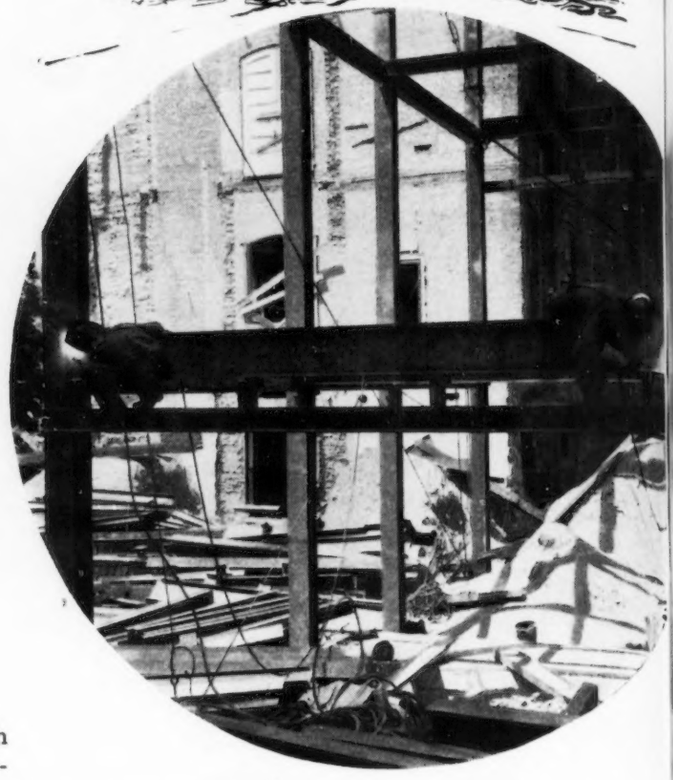
Westinghouse "De-ion" arc quenchers confine, divide and extinguish the arc instantly . . . prevents burning of contacts.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

J-90335

Motors and Control

ON LAND ON SEA



General Electric's full line of "fully approved" electrodes are doing a real job and making profitable arc welding a fact

NO matter what your rod requirements are, the G-E line of electrodes can fill the bill if you're looking for speed plus quality.

The make-up of the base metal in each rod is designed to specifications based on exhaustive research and tests in G-E research laboratories and shops — General Electric rods meet the most stringent standards for finished-weld quality and appearance as well as physical-properties tests.

Each coating on G-E electrodes is made up to allow maximum current and work adaptability and to permit quick escape of gas with thorough slag coverage and minimum spatter-loss. Melting at the proper temperature, the coating on G-E electrodes helps to concentrate the arc by providing the proper amount of ***cupping effect*** to give a well-directed arc that is easy to confine to the area of deposition.

Why not sample the General Electric line of electrodes?

Fill out the coupon below and mail it in today . . . A complete line of samples together with the new electrode bulletin will be made available to you free by the nearest G-E arc-welding distributor of the G-E office in your territory.

General Electric Co., Section A673-9.
Schenectady, N. Y.
Gentlemen:

Please send me, free of charge, a copy of your new Electrode Bulletin, GEA-1546F.

Name .....

Address .....

Company .....

Title .....

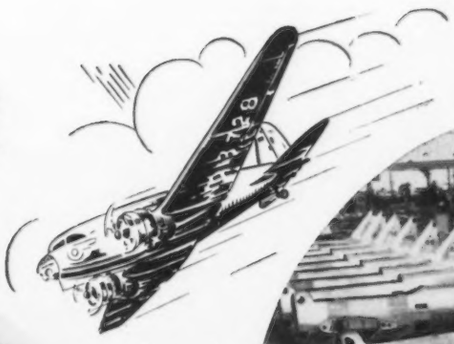
WHETHER you weld bridges, machinery, ships, or planes, you'll find that the high-quality welds resulting from G-E electrodes cut down the cost of rejects and reworking far beyond average expectation.

The extremely high deposition rates of G-E rods, especially the "hot rods," improve production costs by cutting down operator's time per weld unit and increasing the amount of work per hour—*and this is done easier and smoother because G-E rods are so "easy to use" and easy to manipulate.*

Operators in shops throughout the industry are proving that G-E *shop-proved electrodes give better welds at higher speeds with less cost!*

Increased production of G-E electrodes, in two of the most modern electrode factories in the industry, one in Cleveland and one in Baltimore, assures prompt shipment.

IN THE AIR



For Mild Steel—in Any Position

USE G-E W-22, W-20, W-25, F or L

Electrodes for this type of work should provide a quick-setting deposit, easy manipulation, adaptability, and high speed, together with high quality of weld metal.

Approvals

Permitted on work requiring the approval of: Hartford Steam Boiler Inspection and Insurance Co.
American Bureau of Shipping, Groups H1G and B1G.
Lloyds Register of Shipping, Section 4, Par. 1-9.
Others. (Details on Request.)

For Horizontal Fillets and Joints of All Types in Flat Position

USE G-E W-24, W-22-F or W-3

This type of work requires an electrode capable of high-speed production and one that produces finished welds of fine appearance. Electrodes used in welding low-alloy steel must permit deposited weld metal to wash into sides of joints in order to prevent stress concentrations. These electrodes are available for either manual or automatic welding on single- or multipass operations.

Qualifications

A.W.S. Filler Metal, Grade 10.
A.S.M.E. Paragraphs U-68, U-69 and U-70.

Approvals

Permitted on work requiring the approval of:
Hartford Steam Boiler Inspection and Insurance Co.
Lloyds Register of Shipping, Section 4, Par. 1-9.
Others. (Details on Request.)

For Mild Steel—in Flat Position Only

USE G-E W-23, W-4 or Type H

Major portion of this type of work involves butt welds and fillets in flat position, often requiring multipass operations; usually a heavily coated electrode is preferable.

Qualifications

A.W.S. Filler Metal, Grade 10 and 30.
A.S.M.E. Paragraphs U-68, U 69 and U-70.

Approvals

Permitted on work requiring the approval of:
Hartford Steam Boiler Inspection and Insurance Co.
American Bureau of Shipping, Groups HIF and BIF.

For Low-alloy Steels

USE G-E W-52, W-54

These special steels require high-speed electrodes that will produce welds having high tensile strength and ductility, and that are suitable for welding in all positions.

Qualifications: A.W.S. Filler, Grade 4.

GENERAL ELECTRIC

673-9

Things have changed since the boss called in the man from American Steel & Wire Company.

You wouldn't know the old face now!

SMOOTH mechanical operations and higher profits are the usual result when your machines are fed with uniform wire of the proper characteristics. We make that kind of wire. More than a century of wire-making experience has given us a valuable background in answering the toughest problems involving wire. We invite you to investigate our services and our product. American Quality Wire offers you economical, trouble-free production.

Premier Spring Wire · Weaving Wire · Pin Wire · Bolt, Rivet and Screw Wire · Broom and Brush Wire · Pinion Wire · Basic and Bessemer Screw Stock · Premier Tested Welding Wire · Flat Nut Stock · Hair Pin Wire · Mattress Wire · Music Spring Wire · Piano Wire · Amercut Cold Finished Steel Bars · Pump Rod Bars · Wool Wire · Wire Rods · Also U-S-S Stainless and Heat-Resisting Wires

AMERICAN STEEL & WIRE COMPANY

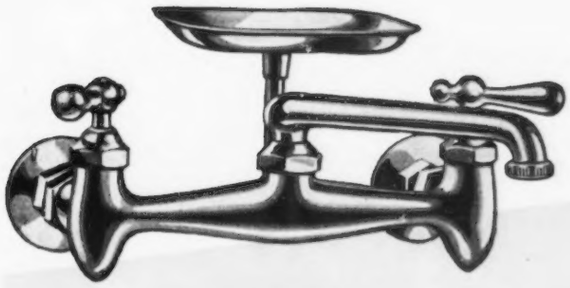
Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS

AMERICAN *Quality* WIRES
FOR MANUFACTURING PURPOSES

UNITED STATES STEEL



Pennsalt Cleaner

saves $170.35 per month in a single cleaning operation for Bohn Aluminum & Brass Corp.

THE Capitol Brass Works Division of Bohn Aluminum & Brass Corp. makes the kind of plumbers' brass goods that helps to bring chrome-plated beauty to modern kitchens and bathrooms. The metal cleaning operation prior to plating involves some special problems, one of which is the removal of the buffing compound used to polish the brass castings.

Too strong a metal cleaner could discolor the brass, yet ordinary cleaners were not effective. But one of the Pennsalt Cleaners was found to be completely effective, safe, and . . . exceedingly economical. By saving time and materials, it saves an average of $170.35 per month in the cost of a single metal cleaning operation.

This is but one example of what the Pennsalt Cleaners are doing for many industries. They have won their place in each plant by doing a better job at lower cost. For heavy-duty operations there is Orthosil, the original product in this line. For varied and extreme requirements there is a series of other Pennsalt Cleaners that meet every need with laboratory precision.

They all have tremendous dissolving and emulsifying action; unusual lasting power; and insure quick, efficient cleaning. Why not test their savings in your own processes? Write Dept. D. Pennsalt Cleaner Division, Pennsylvania Salt Mfg. Co., Widener Building, Phila., Pa.

Other Pennsylvania Salt Chemical Products used in large quantity by industry

Anhydrous Ferric Chloride		Carbon Tetrachloride
Mineral Acids	Kryolith	Soda Ash
Caustic Soda	Sal Ammoniac	Acid-Proof Cements

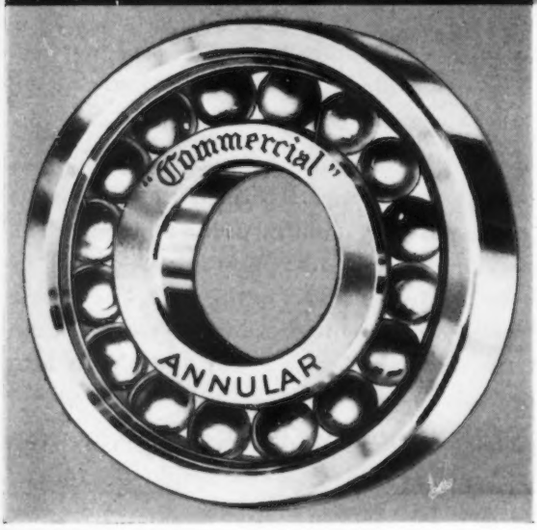
PENNSALT

CLEANERS FOR INDUSTRY

PENNSYLVANIA SALT
MANUFACTURING COMPANY

Chemicals

Accuracy and Precision



"Commercial"

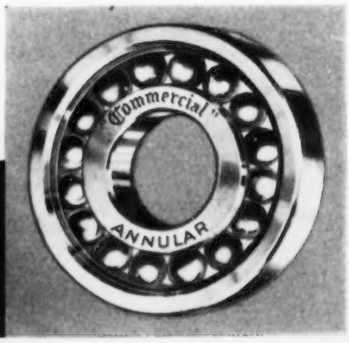
ANNULAR

BALL BEARINGS

THESE highly efficient bearings are manufactured with the most exacting care by ball bearing experts. Accuracy and precision are outstanding characteristics of all "Commercial" Annular Ball Bearings and for this reason they are preferred by those who demand quality and efficiency.

THERE is no job too difficult for "Commercials" They stand up under the most gruelling service conditions. Overloads and side-thrusts are easily sustained. Speeds up to 2500 R.P.M. with dual thrust capacity. High grade steels, carefully heat-treated, assure long life and uninterrupted performance, plus economical operation.

OUR Engineering Staff will be pleased to assist in making recommendations regarding the *correct* type of bearing for any product you make, or any machine you operate. Write for complete information and latest catalog.



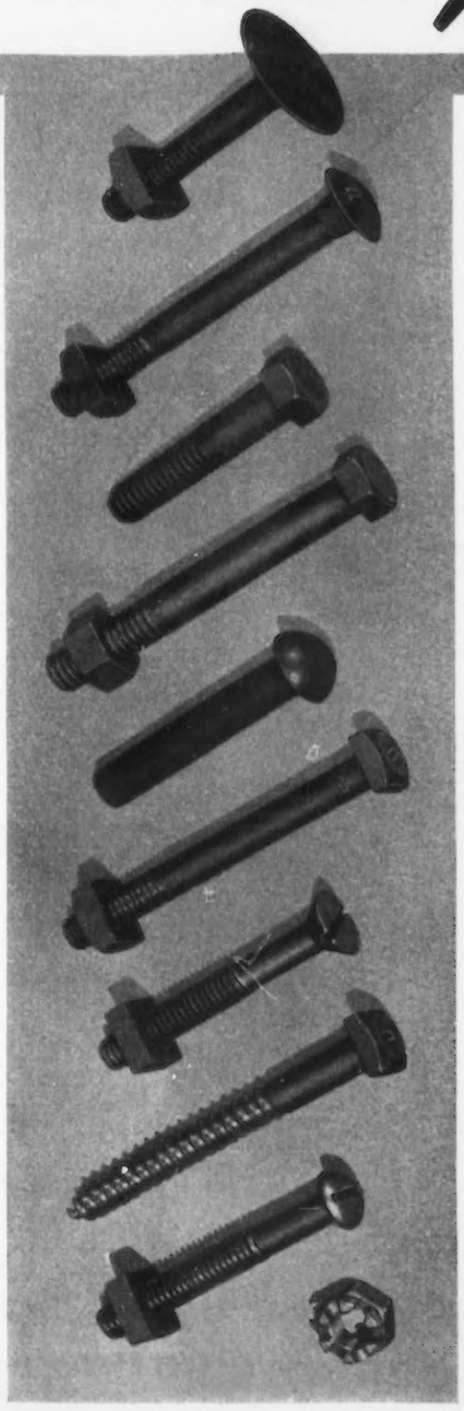
THE SCHATZ MANUFACTURING CO.

POUGHKEEPSIE, N. Y.

Detroit Sales Office: 2608 Book Tower • Chicago Sales Office: 902 S. Wabash Ave.

Cleveland Sales Office: 402 Swetland Building

TIE UP WITH UPSON
and avoid assembly tie-ups



EASY TO ASSEMBLE

You won't experience delays and tie-ups in assembly due to off-size bolts and slow-fitting threads when you use Republic Upson headed and threaded products. These bolts and nuts are made for fast assembly.

Shanks are highly accurate to size — permitting bolts to slide through holes without difficulty. The first bolt tried always fits. There is no need to reach for a second bolt and no reaming.

Because threads are clean and sharp, nuts go on with ease. Bolt heads and nuts are full size. Wrenches fit snugly — prevent slippage.

The next time you need headed and threaded products, order Republic Upson — and see for yourself how well your workmen like them and how they keep assembly work moving.

Tie up with Upson — it pays in many ways.

• • •

Write for a copy of Catalog No. 307. It will bring you sizes, weights, specifications and other information on the Republic Upson line. Republic Steel Corporation, Bolt and Nut Division, Cleveland, Ohio.

REG. U. S. PAT. OFF.
REPUBLIC STEEL

BERGER MANUFACTURING DIVISION
NILES STEEL PRODUCTS DIVISION
STEEL AND TUBES DIVISION
UNION DRAWN STEEL DIVISION
TRUSCON STEEL COMPANY

STRONG AND TOUGH

Since the purpose of bolts, nuts and rivets is to hold materials together with provision for easy dismantling when repairs may be necessary, they must be strong and tough. That Republic Upson headed and threaded products may possess these requisites in needed degrees, Republic produces its own steel processed specifically for bolt making.

Throughout every step of manufacture — from the blast furnace to the final heat treatment — Republic metallurgists check and double-check the qualities of the steel as it moves from operation to operation.

Thus, if your use necessitates a definite strength, toughness or hardness all you need to do is specify your requirements on your order for Republic Upson bolts and nuts. When you receive the shipment, every item will meet your specifications.

REPUBLIC

UPSON

HEADED AND THREADED PRODUCTS

OTHER REPUBLIC STEEL PRODUCTS FOR INDUSTRY

Alloy and Carbon Steels, Enduro* Stainless Steel, Republic Double Strength Steel, Toncan* Copper Molybdenum Iron, Pig Iron, Sheets; Strip, Bars (Hot Rolled and Cold Drawn), Pipe, Tubing, Boiler Tubes, Roofing, Wire, Fencing, Conduit, Bins, Shelving, Cabinets, Lockers, Standard Steel Buildings

*Reg. U. S. Pat. Off.

TUMBLING BARRELS by BAIRD

AT RIGHT this picture shows the barrel mounted on a BAIRD leg type tilting tumbler.

The size of the barrel to be mounted on the No. 2 Machine is 24 in. dia. 8 in. long.

Barrels may be of sheet steel or of cast iron.

Barrels may be used for rolling articles in sand or other abrasive or lined with wood on sides for burnishing articles with steel balls.

A convenient barrel for mounting on standard BAIRD TUMBLERS.

ASK BAIRD ABOUT IT

AT LEFT a 20 in. dia. 6 in. long closed barrel mounted on a No. 1 BAIRD MODEL B or pedestal type Oblique Tilting Tumbler with motor drive.

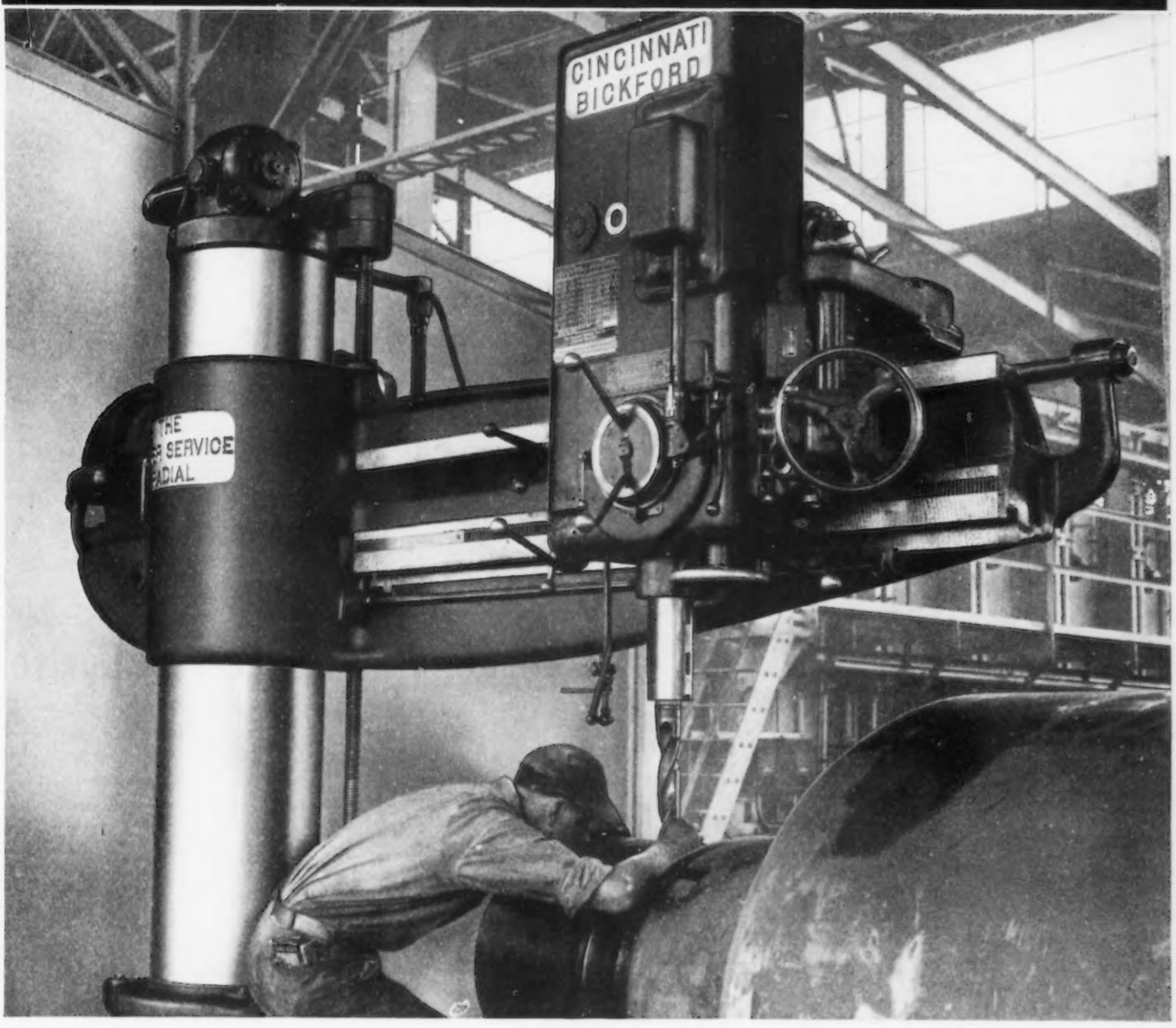
This also shows that it is arranged for burnishing with steel balls. The barrel had its sides lined with wood. The upper tray reciprocates in the lower to separate the balls from the work. The base is hollow to catch the liquid which is carried away by suitable piping.

THE BAIRD MACHINE CO., BRIDGEPORT, CONNECTICUT

THE BAIRD LINE OF PRODUCTION EQUIPMENT INCLUDES: Wire Forming Machines, Wire and Welding Machines, Ribbon Metal Forming Machines, Multiple Spindle Automatic Lathes, Automatic Grinders, Grinding and Turning Machines, Foot Presses, Open Back Presses, Pillar Presses, Single Transfer Presses, Multiple Transfer Presses, Tandem Presses, Special Presses, etc.

Throughout Industry...

THIS SUPER C B SERVICE TRADEMARK MEANS "MORE HOLES PER DOLLAR"!



MANUFACTURING A 44,000 LB. ROLL

• The job shown is a sample of the heavy work this Super Service Radial performs in the building of massive rolling mill equipment at the plant of United Engineering & Foundry Co., Vandergrift, Pa. For reasons explaining this machine's superiority, send for Bulletin R-24.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

New Fitting Lets Rayotube Penetrate Furnace Flame

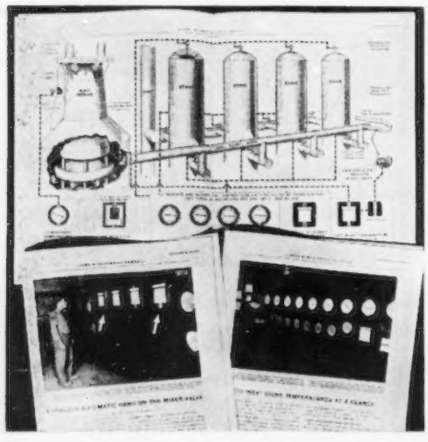
How to measure the temperature at the actual surface of a piece of metal while it is in a furnace is now fairly well known, providing there's no smoke, flame, etc., in the way. Either an L&N Optical Pyrometer or a Rayotube can be aimed at the work to secure a quick check, and if automatic record or control is wanted, a Rayotube is used, connected to a Micromax or Speedomax Pyrometer.

If smoke or flame are present, however, there's now a new answer which sometimes applies. This is to use an appliance which gives the Rayotube a clear sighting path directly to the surface of the work, practically regardless of the clearness of the furnace atmosphere. This appliance is comparatively simple. A description of it is available for anyone to whose problem it applies. For a general description of Rayotube, ask for Catalog N-33B.

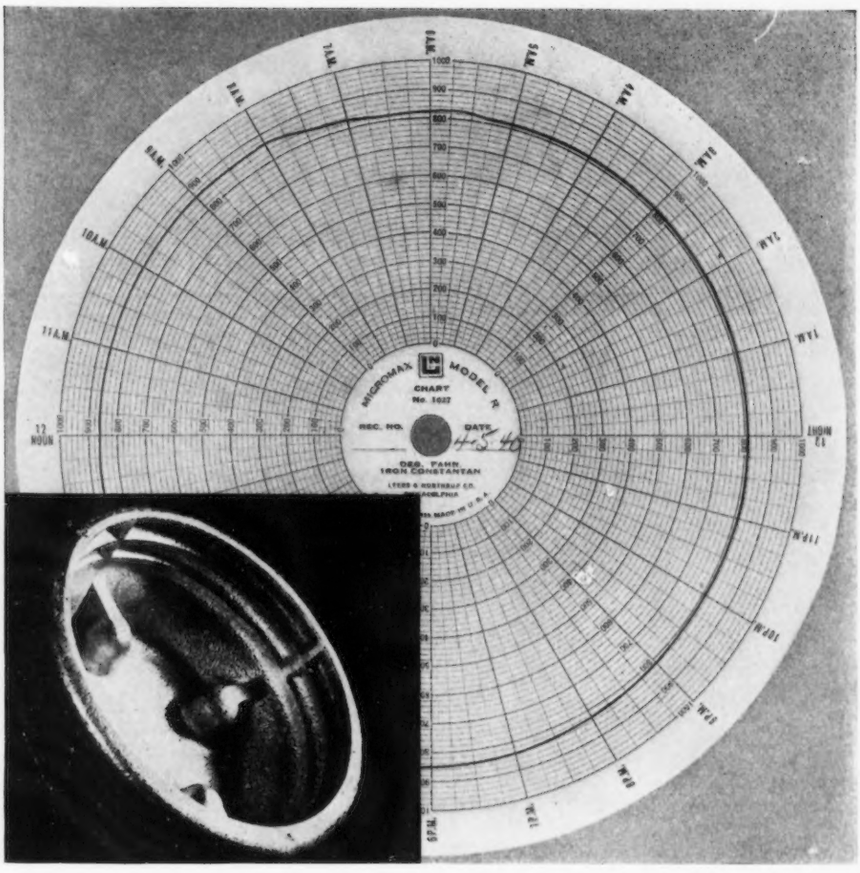
New Hot Blast Control In Micromax Catalog

With the appearance of the new Micromax Control for hot blast temperatures, things have happened in the operation of blast furnaces. For this is a genuine re-design of past equipment. It has a new drive-unit and a new way of directing its action, so that the Control receives the fullest benefit of the responsiveness of the Micromax pyrometer. The blast reaches the furnace at correct temperature, and steady pressure is easier to hold. Conditions at the fusion zone tend to be more uniform. There is frequently an increase in tonnage, with decrease in coke practice and dust losses. And, of course, uniform hot-blast helps to control sulphur and silicon.

This story is now compressed into a 20-page book on hot-blast control and temperature instrumentation for stove and downcomer temperatures. Ask for Catalog N-33A-642; "Blast Furnace Temperatures Recorded-Controlled by Micromax".



Typical pages from new L&N Catalog showing illustration and text on Micromax Hot-Blast Control.

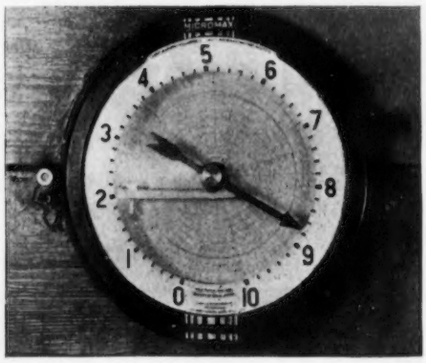


Typical steel part, galvanized by Charles E. Schuler Engineering Co., Newark, Ohio; and a typical day's record showing the close Micromax control of temperature.

Gets $50 Free Fuel Every Month By Using Micromax Furnace Control

It would cost the Charles E. Schuler Engineering Co., Newark, Ohio, just fifty dollars a month to disconnect the Micromax Electric Control on their galvanizing-pot furnace. They know this because the furnace was purchased without the control and was, for a time, regulated by its operator. When Micromax Control was added, the bills for gas fuel dropped $50 a month. The change was made nearly a year ago, and savings have been consistent ever since.

The standard Micromax fits any furnace, on any process. Write for Broadside N-33.



Close-up of Micromax Controller which saves $50 a month in fuel for its user.

Jrl Ad N-33-0600C(2)

LEEDS & NORTHRUP COMPANY, 4956 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

TO KEEP POSTED ON INDUSTRIAL PRODUCTS GET THIS

INFORMATION free

(1) Surface Grinder:

General description and typical examples of work performed on Blanchard No. 11 grinder, smallest grinder manufactured by the company, are given in catalog No. 217 issued by Blanchard Machine Co. Machine turns out work with a very fine finish, it is claimed, and is adaptable for use either on production work or job work. Features include direct motor drive, centralized location of controls and ample passages to circulate air through the motor for cooling.

(2) Annealing Atmospheres:

Equipment for production and control of annealing atmospheres is described in bulletin prepared by C. M. Kemp Mfg. Co. Equipment includes Kemp industrial carburetor for accurate proportioning of fuel gas and air for combustion, a constant analysis monitor which provides a continuous graphic record of atmosphere analysis acts to control the pre-selected analysis gas within very fine limits. Tables of capacities, weights and measurements of gas producers are included.

(3) Crucible Steel:

Latest issue of *Crucible News*, published by Crucible Steel Co. of America, contains a detailed description of equipment and products manufactured by Pittsburgh Crucible Steel Co. Especially interesting are descriptions of electrolytic tin mill and cold finishing department.

(4) Foundry Equipment:

Bulletin B-6092 issued by Allis-Chalmers Mfg. Co., illustrates and describes flask shakeouts, conditioners for screening, blending and aerating sand, vibrating screens, centrifugal pumps, cupola blowers with constant air weight control, motors, Texrope drives, and other foundry equipment. Large number of installation views are included.

(5) Water Softeners:

Hot process continuous water softeners designed for stationary steam boiler plants are discussed in bulletin issued by Graver Tank & Mfg. Co., Inc. Drawings show types of softeners available, while text gives details concerning component parts of the units.

(6) Thread Grinding:

Grinders for turning out precision threads on production basis are described in bulletin by Ex-Cell-O Corp. Enlarged photographs show value of precision grinding, while other photographs show typical threaded parts produced on these machines.

(7) Bending Presses:

New bending press catalog No. 2002-28 is available from Steelweld Machinery Division, Cleveland Crane & Engineering Co. Booklet gives reasons for all-welded steel construction used, gives data on dies, bends possible, multiple punching and other engineering information.

(8) Spring Design:

"Scientech," the science of spring design plus the technique of spring building, is described in bulletin issued by Lee Spring Co., Inc. A spring specification form, designed to simplify selection and ordering of springs is also included. This form notes permissible variations, physical specifications, operating conditions, and such design and fabricating values as are governed by operating conditions.

(9) Welded Rings:

Production of welded steel rings and flanges rolled from standard bar stock, by company which has specialized in this work for thirty years, is described in booklet by King Fifth Wheel Co. Rings made by the company are said to be true to size within 1/16 in. Company also rolls rings from aluminum, stainless, brass, copper, bronze, nickel, Monel and Everdur.

(10) Bearing Lubrication:

Comprehensive discussion of problems of lubrication and maintenance of ball and roller bearings is contained in bulletin No. 506A prepared by New York & New Jersey Lubricant Co. Various types of lubricants available, selection of the proper lubricant, and proper method of handling lubricants are touched upon in this instructive booklet.

(11) Rust-Preventing Paint:

Kemick, a chemical rust preventing paint for metal surfaces that are subjected to high temperatures, is described in folder issued by American Chemical Paint Co. This material, suitable for use on steel, iron, copper, brass, aluminum, zinc and galvanized iron at temperatures below their melting points, can be applied either with brush, spray gun or by dipping. It is claimed that this material stays put even though metal becomes red hot.

(12) Wire Forming Machines:

Automatic four-slide wire forming machines for round and flat wire are covered in bulletin No. 52B issued by A. H. Nilson Machine Co. Average speed of material passing through these machines is 350 r.p.m. Wire feeding is silent and frictionless and is in straight line from crack disc. Specifications and samples of typical work performed on machines are also contained in this bulletin.

(13) Industrial Trucks:

General catalog No. 51, covering a wide variety of platform, lift, fork, ram and crane type industrial trucks is available from Baker-Raulang Co. Features of these trucks and recent improvements are discussed in considerable detail. Photographs show numerous ingenious applications of this equipment in various industrial handling problems.

Circle as many free booklets as you require on one of the post cards. No postage — no obligation. If you want information on products advertised in this issue — indicate the page numbers on this card.

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(14) Wire Forms:

A booklet, prepared to help the spring user by giving him an up-to-date spring information for everyday use, is being distributed by Accurate Spring Mfg. Co. Commercial tolerances, spring design, and other factors which should be included when specifying springs, wire forms and stampings, are discussed.

(15) Cut-Off Wheels:

Treatise on selection, application and maintenance of cutting off wheels is available from Carborundum Co. Both wet and dry operations are covered. The claimed advantages of Carborundum and Aloxite brand cutting off wheels are discussed.

(16) Electrical Parts:

Approved precision products for industrial electronic needs are described and illustrated in new 1940 catalog prepared by P. R. Mallory & Co., Inc. Catalog serves as handy reference handbook of electrical items used in practically every manufacturing plant in maintenance, laboratory and experimental work. Descriptions are very complete and prices are given.

(17) Do-All Scrap Book:

Scrap book of typical work performed by users of Do-All contour shaping machines, containing many practical suggestions for reducing machining costs, has been prepared by Continental Machines, Inc. Details as to material involved, layout, time required by various methods, etc., are given for each job illustrated. Work ranges from cutting 44 pieces of bronze at one time to die casting molds and armor plate sampling.

(18) Beam Arch Construction:

Discussion of advantages of beam arch construction as applied to buildings, bridges, etc., is contained in booklet issued by American Bridge Co. In addition to giving a rigid frame with attractive lines, this construction method is said to result in increased headroom and usable space, less height required for enclosing walls and a reduction in building volume.

(19) Machine Specialties:

Description and prices covering machines screws, stove bolts, machine screw nuts and other cold headed specialties manufactured by Progressive Mfg. Co., are given in catalog No. 17. Special, made-to-order parts stressing quality and accuracy are also illustrated.

(20) Drilling and Tapping:

Booklet No. 2, intended to show versatility of self-oiling, all-geared drilling and tapping machines and Hydrams, is available from Barnes Drill Co. Over 36 illustrations show fixturing and tooling for quantity production at minimum labor cost.

(21) Speed Reducers:

Selection tables, performance data and outstanding features of motorized planetary speed reducers are contained in catalog issued by D. O. James Mfg. Co. Efficiencies of units are listed at 98 per cent.

(22) Stainless Electrodes:

Test results, composition and use of stainless steel electrodes are covered in booklet prepared by Arcos Corp. Phosphor bronze, Everdur, nickel, mild steel and cast iron electrodes are also touched upon.

(23) Oilless Bearings:

Oilless bronze bearings, for use where it is desired to eliminate oil drippings and frequent maintenance attention, or where operating conditions break down oil and grease too quickly, are described in bulletin by R. W. Rhoades Metaline Co., Inc. Serviceable life of these bearings is said to exceed that of graphite type oilless bearings. Installation hints, dimensions, and typical applications are covered.

(24) Hacksaw Blades:

Helpful hints on the care and use of hacksaw blades are given in booklet prepared by Simonds Saw & Steel Co. Tungsten and molybdenum and hand blades are covered and prices of various types are given.

(25) Nitriding:

Nitriding, the case-hardening of certain alloy steels by means of a nitrogenous medium, is described in booklet issued by Nitralloy Corp. Alloy steels particularly adapted to this treatment, known as Nitralloy, are also described. Bulletin is particularly thorough and complete with all pertinent data. Numerous photographs illustrate the text.

(26) Tool Steel Guide:

Chart, suitable for shop wall mounting, showing analysis, recommended heat treatment and uses of Sheffield tool steel is available from Wm. Jessop & Sons, Inc.

(27) Steel Legs, Bases:

Stock list showing large assortment of pressed steel legs and base units designed for stove, refrigerator, metal furniture and institutional equipment use, is available from Davis Brake Beam Co. Dimensions, gages, finishes, piercings, etc., available are given. Use of stock legs eliminates tool charges, thus reducing unit costs, it is pointed out.

(28) Locomotive Cranes:

Features of construction and operating characteristics of diesel and gasoline locomotive cranes are discussed in bulletin No. 371 by Industrial Brownhoist Corp. Cranes available in capacities from 10 to 50 tons, with rotating and travel speeds up to 20 miles per hr. are illustrated. Features are said to include economy of operation and low maintenance costs.

(29) Industrial Scales:

Crane, platform, pan, bench, track and counting springless scales are illustrated and described in condensed catalog No. 7 by Kron Co. All parts of dial mechanism are interchangeable. Capacities and dial graduations available in each type are given and features of dial mechanism construction are cited.

(30) Bearing Metals:

Physical properties and performance characteristics of non-ferrous bearing metals for general industrial use are given in book published by National Bearing Metals Corp. Book is designed to aid in selecting proper alloy for specific operating conditions.

THE IRON AGE
New York, N. Y.
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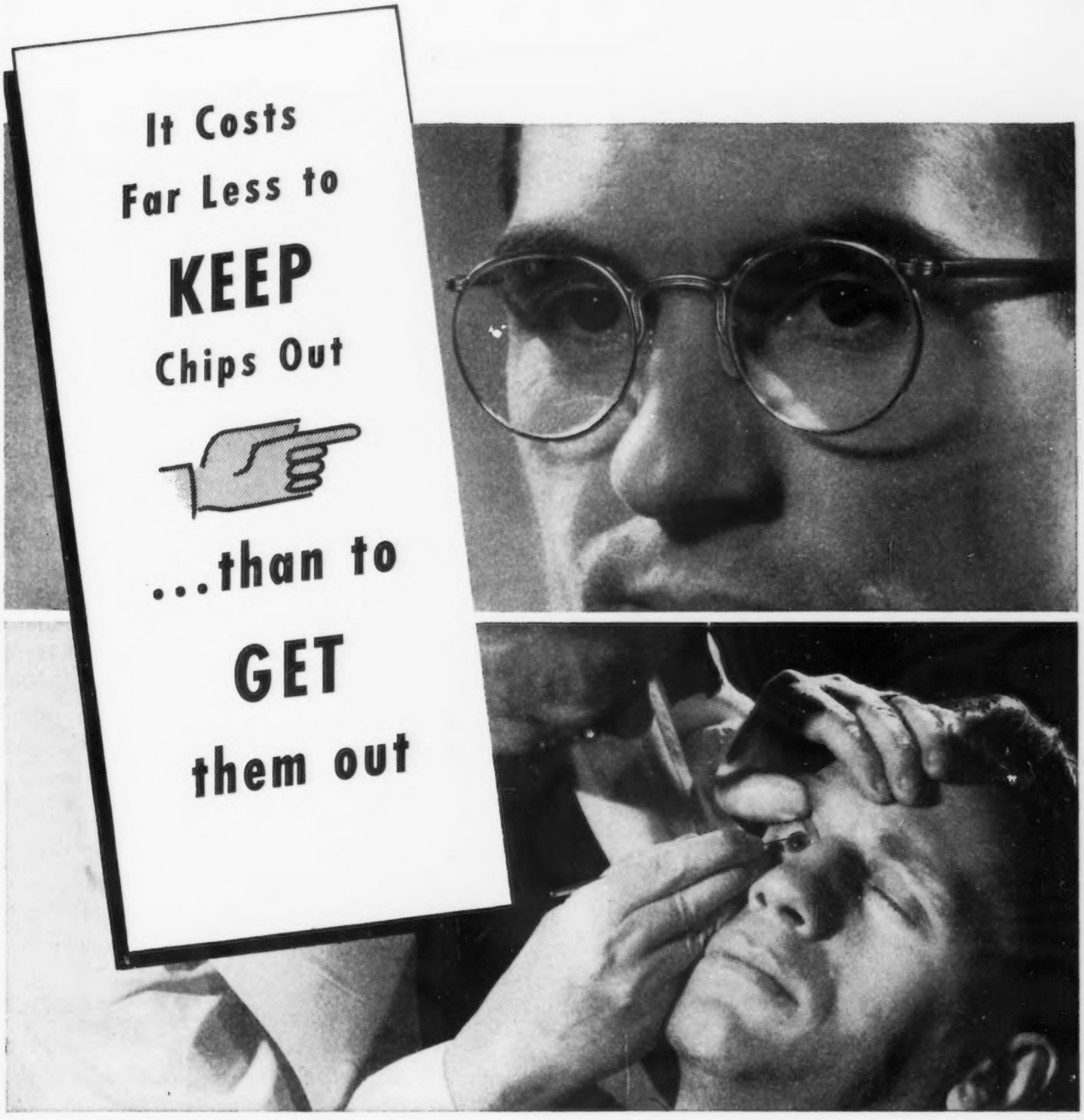


Eyes that are guarded by goggles have no need of the doctor's probe. They remain steadily at work . . . *protected from the chips that are bound to fly.* And whenever a lens turns back a chip, you save the cost of the goggles right there. Plus charges anywhere up to a couple of thousand dollars for lost time, undone work, surgical and medical attention, compensation, and "incidentals" like training a new man.

Yes, goggles keep you ahead of the game . . . keep you free from losses that cut profits to the bone. So in plain line of duty to your company, *resolve now* to have your AO representative plan complete Eye-Protection that will give every one of your men a comfortable, good-looking pair of American Goggles, fitted with deep-curved, *extra strong* Super Armorplate Lenses. Write the nearest branch office today.

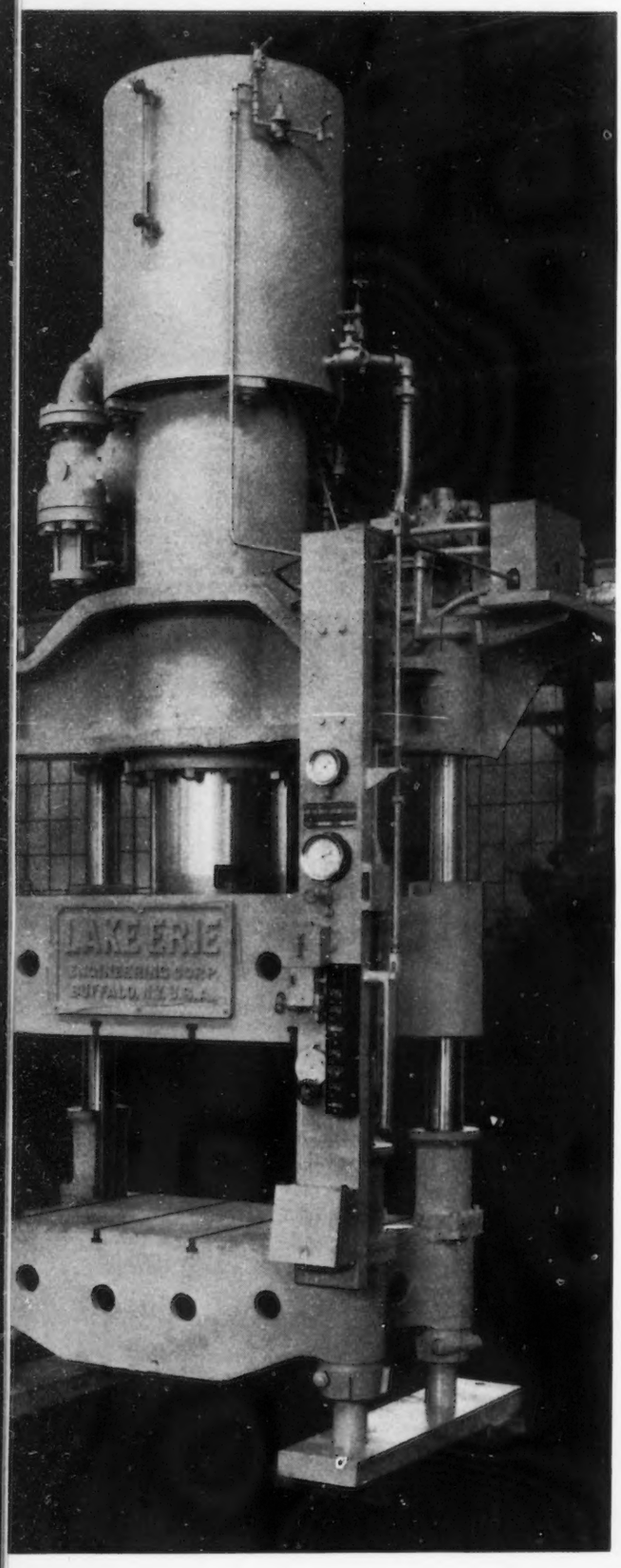
American Optical Company

FACTORIES AT SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS, FOR MORE THAN 100 YEARS, OF PRODUCTS TO AID AND PROTECT VISION

'ou don't need BIG PRODUCTION

to make a LAKE ERIE Hydraulic PRESS Pay for Itself . . .



owing a 275 ton Lake Erie Hydraulic Press having a de range of applications for general stamping work. ote self-contained pumping unit, push button control d complete accessibility to working space from all ur sides.

Each year more manufacturers are finding that Lake Erie Hydraulic Presses are playing an increasingly important part in reducing production costs.

They are further justified by savings in assembly costs due to uniformity of parts and elimination of slow hand fitting.

In addition, unusual economies in die costs made possible by the use of wood, cast iron, rubber and other inexpensive materials, make Lake Erie Hydraulic Presses adaptable for limited as well as volume production. Change over for various operations is quickly and easily made, thus making it possible to use presses on short as well as long runs.

Those are some of the reasons why Lake Erie Hydraulic Presses are paying for themselves by improving production practices for a wide variety of products including airplanes, automobiles, cameras, pressed steel bathtubs, electrical equipment and many others.

Lake Erie Hydraulic Presses are built in sizes from 175 tons up. Take advantage of the broad experience of Lake Erie Engineers in applying the economies of hydraulic presses to a wide range of usual and unusual requirements. Put it up to Lake Erie.

LAKE ERIE ENGINEERING CORP.
368 Kenmore Station, Buffalo, N. Y.

Sales Offices: New York, Chicago

English & Miller Machinery Corp., Detroit
Harron, Ricard & McCone, San Francisco and Los Angeles
John Inglis, Ltd., Toronto, Canada
Buck & Hickman, Ltd., London, England
Fenwick, S. A., Paris, France, and Milan, Italy

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

They Called in a NORTON SERVICE Engineer

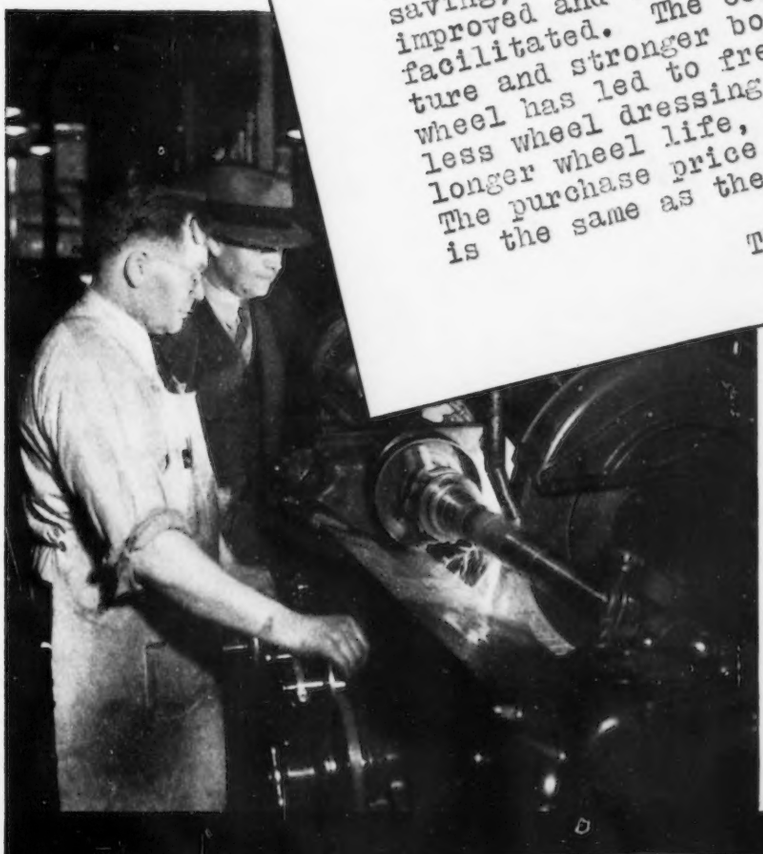
And Cut Grinding Costs 35-50% as shown by this report from their Time Study Department

To Mr. ----------, Superintendent

The recent change in cylindrical grinding wheels from ------- to Norton 60-L5BE made possible new grinding standards. These standards have been completed, and corrected rates are now in general use. The rates to date have been reduced 35% on the average -- some particular jobs as much as 50%.

In addition to this large labor saving, the surface finish has been improved and the machining limits facilitated. The controlled structure and stronger bond of the new wheel has led to freer cutting action, less wheel dressing and therefore longer wheel life, estimated to be 20%. The purchase price of the new wheels is the same as the old.

TIME STUDY DEPARTMENT



The time study report reproduced above shows clearly the results that can be obtained when a Norton engineer puts the right grinding wheel on a job. This Consulting Engineering Service is available to you, too—let it go to work for you.

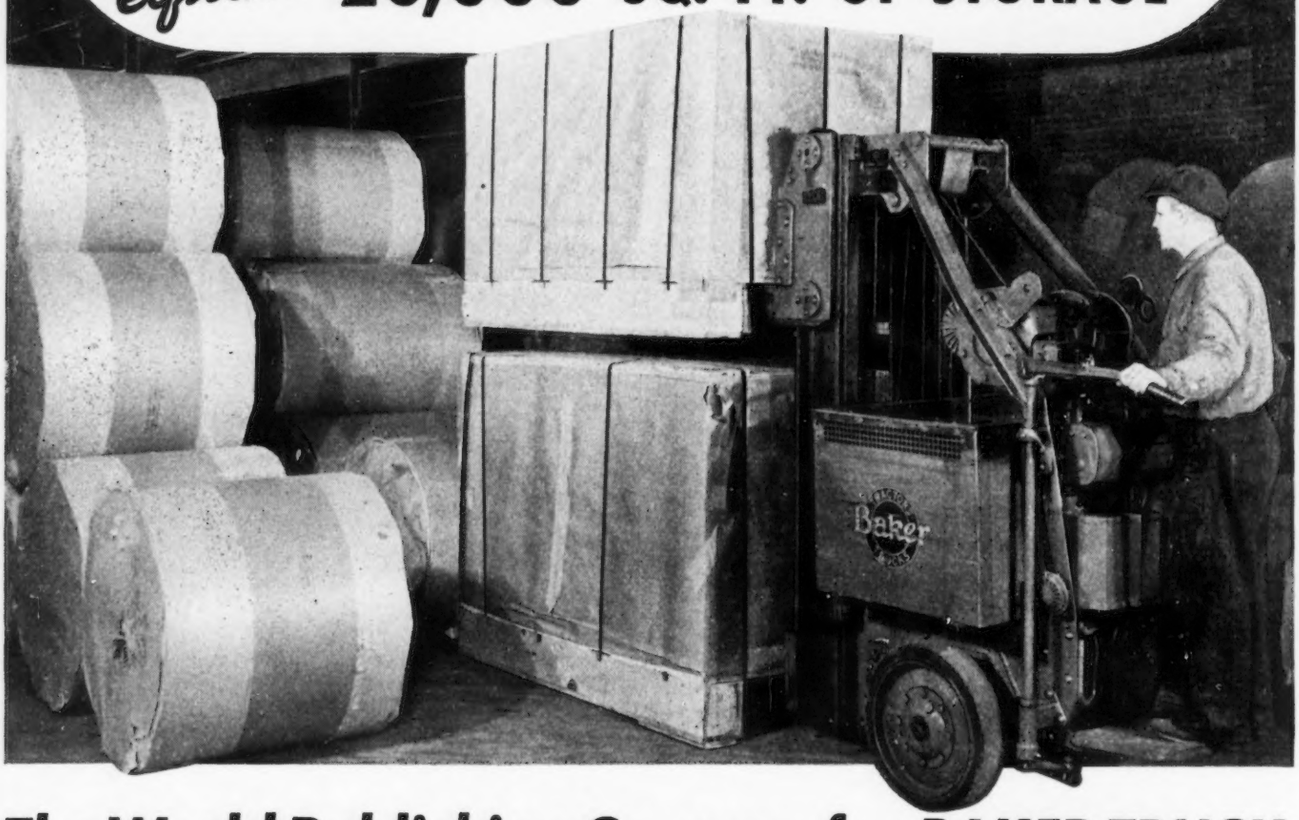
NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia
Pittsburgh Hartford Cleveland Hamilton, Ont.

W-764

NORTON ABRASIVES

10,000 SQ. FT. OF FLOOR SPACE
plus BAKER HY-LIFT TRUCK
equals 20,000 SQ. FT. OF STORAGE



The World Publishing Co. pays for BAKER TRUCK in 18 months' rental savings

● Four years ago The World Publishing Company of Cleveland needed extra storage space. They purchased a Baker Hy-Lift Truck which enabled them to make every floor foot count double and reduced their requirements by 10,000 sq. ft. "In rental savings alone our truck paid for itself in 18 months," they told us. "We also cut by ⅔ the time required for unloading skids of paper from box cars—an additional saving—and we are using the truck constantly for maintenance and millwright work on our machines, and for many other odd jobs."

● Increasing storage space without increasing floor space is only one achievement of Baker Trucks. Another is increasing production without expansion. The Baker Material Handling Engineer will be glad to show you how they apply to *your* plant.

BAKER INDUSTRIAL TRUCK DIVISION
of the Baker-Raulang Company
2175 WEST 25th STREET • • CLEVELAND, OHIO

In Canada: RAILWAY & POWER ENGINEERING CORPORATION, LTD.

Trade mark Registered U. S. Pat. Off.
Baker INDUSTRIAL TRUCKS

DEMAND THE ELECTRODE THAT MEETS THE TEST!

Hartford
Appearance Weld

WILSON NO. 851
(SHIELDED ARC)

It's available at local distributors

Pressure vessel welding requires high quality electrodes capable of meeting the rigid Hartford specifications — therefore specify Wilson #851 which meets the test *with plenty to spare.*

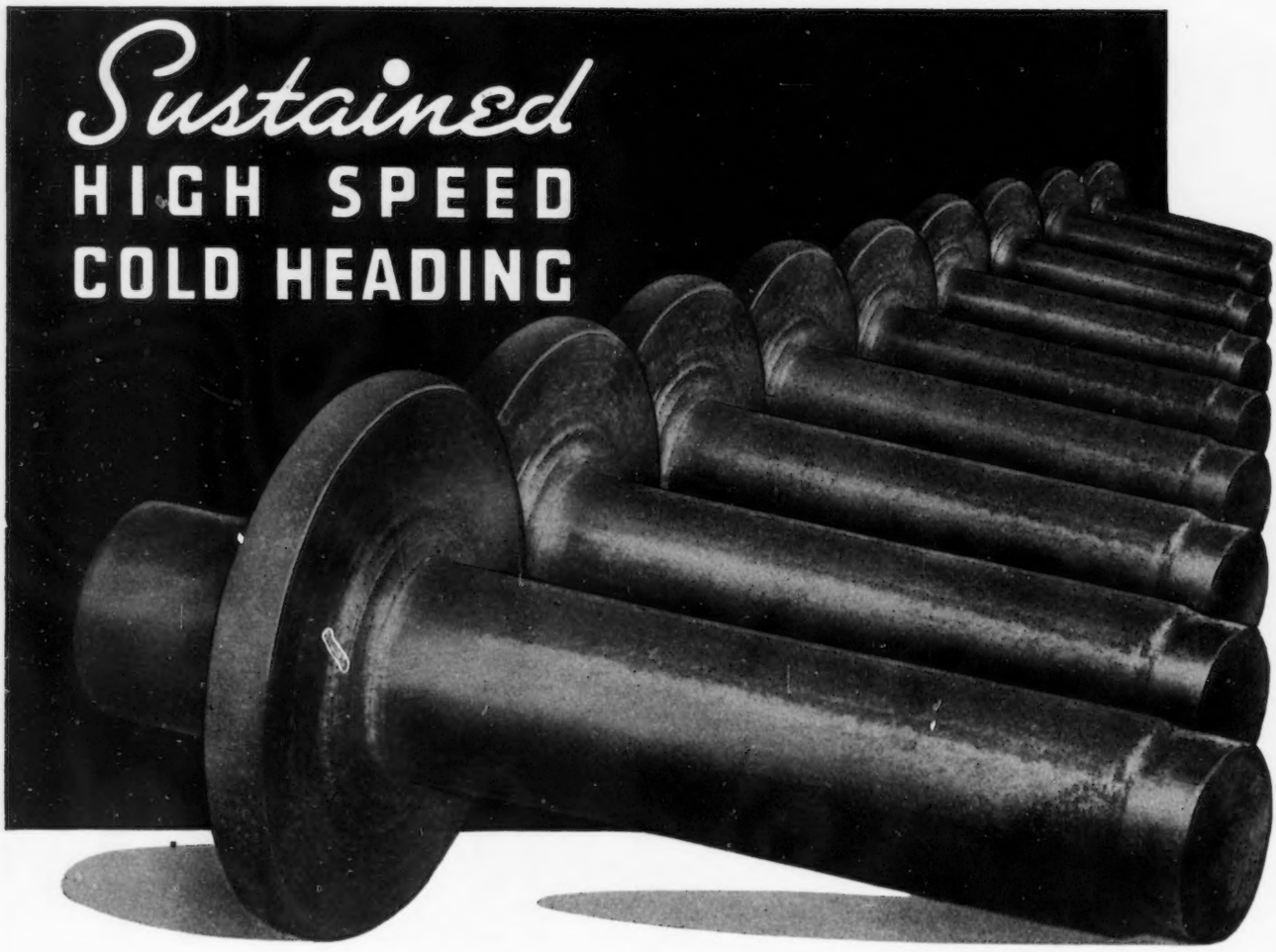
Wilson #851 is primarily recommended for "U" or "Vee" butt joints where welding is done in a flat position. It is also recommended for horizontal fillet welding. It can be used with exceptionally high currents to insure fastest possible welding speeds. Weld deposits have excellent physical properties which exceed those prescribed for Grade 10 by the A. W. S. filler metal specifications and meet the requirements of paragraphs U68 and U69 of the A. S. M. E. Code for Unfired Pressure Vessels. Spatter loss is low. The resultant slag prevents oxidation of the newly deposited metal, yet is practically self-removing after the weld has cooled.

You can obtain from your local dealer a supply of Wilson #851 and all other Wilson Electrodes — there's one for every arc welding need. Write for your copy of the new Wilson Electrode Catalog. Copy will be sent upon request.

WILSON WELDER and METALS CO., INC.

WILSON

***General Offices:* 60 East 42nd Street, New York, N. Y.**



Needs Pittsburgh's smooth-flowing DEPENDABLY UNIFORM WIRE!

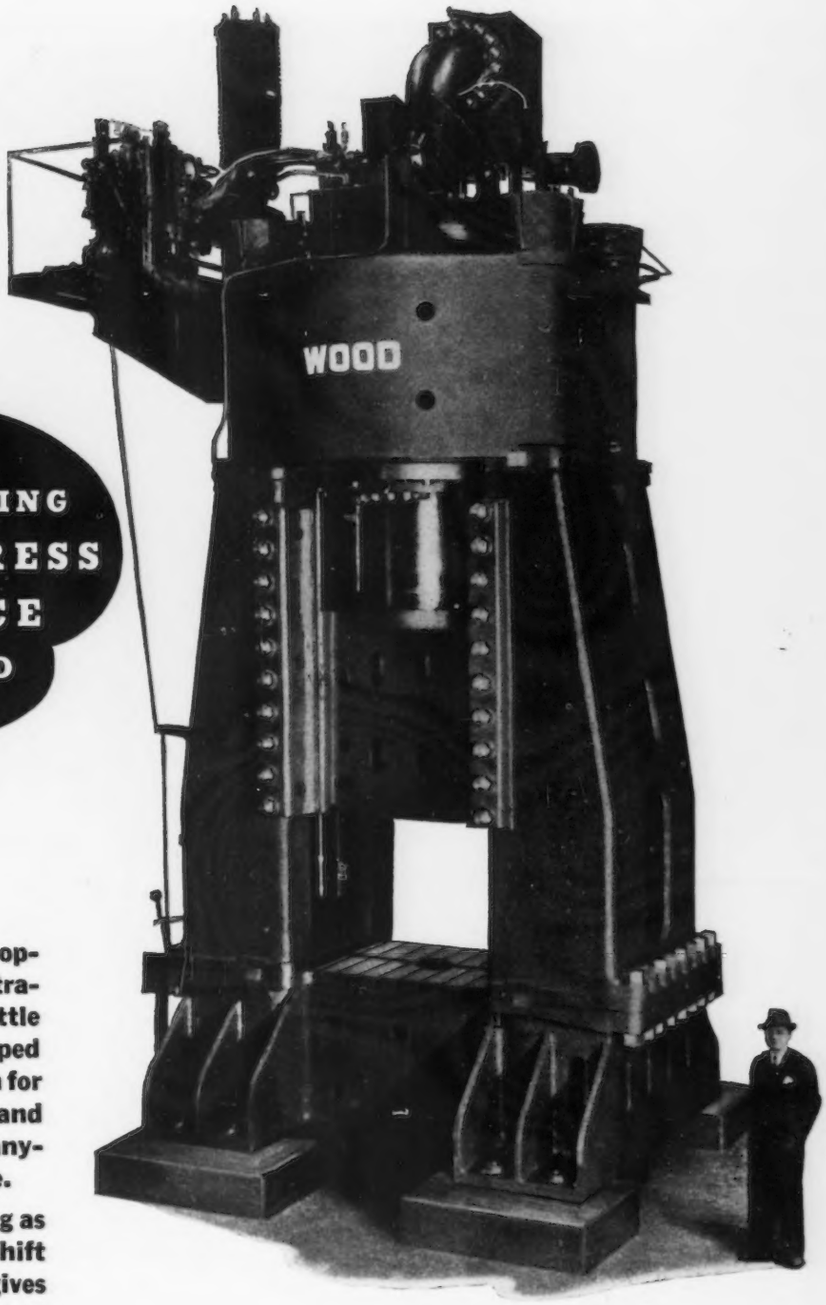
Reaching the high production level of modern cold heading equipment is one thing . . . *sustaining* it is another. Precision control within new close tolerances makes the job even more difficult. Abreast of today's high speed demands, Pittsburgh Cold Heading Wire overcomes even the most stubborn difficulties through *dependable* uniformity and *consistent* flawlessness. *One* organization control, from ore to final inspection, results in unvarying structure, surface, composition, temper, and gauge . . . *your* assurance of sustained, trouble-free production. Try *Pittsburgh* for a new conception of Cold Heading Wire perfection.

Pittsburgh WIRE & WIRE RODS

A COMPLETE LINE FOR ALL FABRICATING NEEDS

PITTSBURGH STEEL COMPANY
1642 GRANT BUILDING · PITTSBURGH, PA.
New York Detroit Chicago Cleveland Houston Los Angeles

THE MOST OUTSTANDING HYDRAULIC PRESS PERFORMANCE EVER ACHIEVED



This 3000 Ton WOOD Press Unit, operated from a 4500# per. sq. in. ultra-modern pumping and air bottle accumulator system, is equipped with an ingenious control which for ease of operation, sensitivity, and speed regulation, far surpasses anything ever accomplished before.

A single control lever, operating as easily and smoothly as a gear shift lever on a modern motor car, gives instantaneous control of the ram speed, depending solely on the length of the control lever movement. *ANY* speed from zero to 1200" per minute for approach and return, and from zero to 270" per minute under full pressure, can thus be obtained. Furthermore, the press ram can be stopped instantaneously in any position of its up or down stroke.

In actual performance a maximum of 45 cycles per minute with 3" stroke, under full press tonnage, has been obtained. At the same time, the single lever controls the force exerted ranging between a gentle tap and a smashing blow of 3000 tons, the latter being equal to a 4800 instantaneous horsepower requirement.

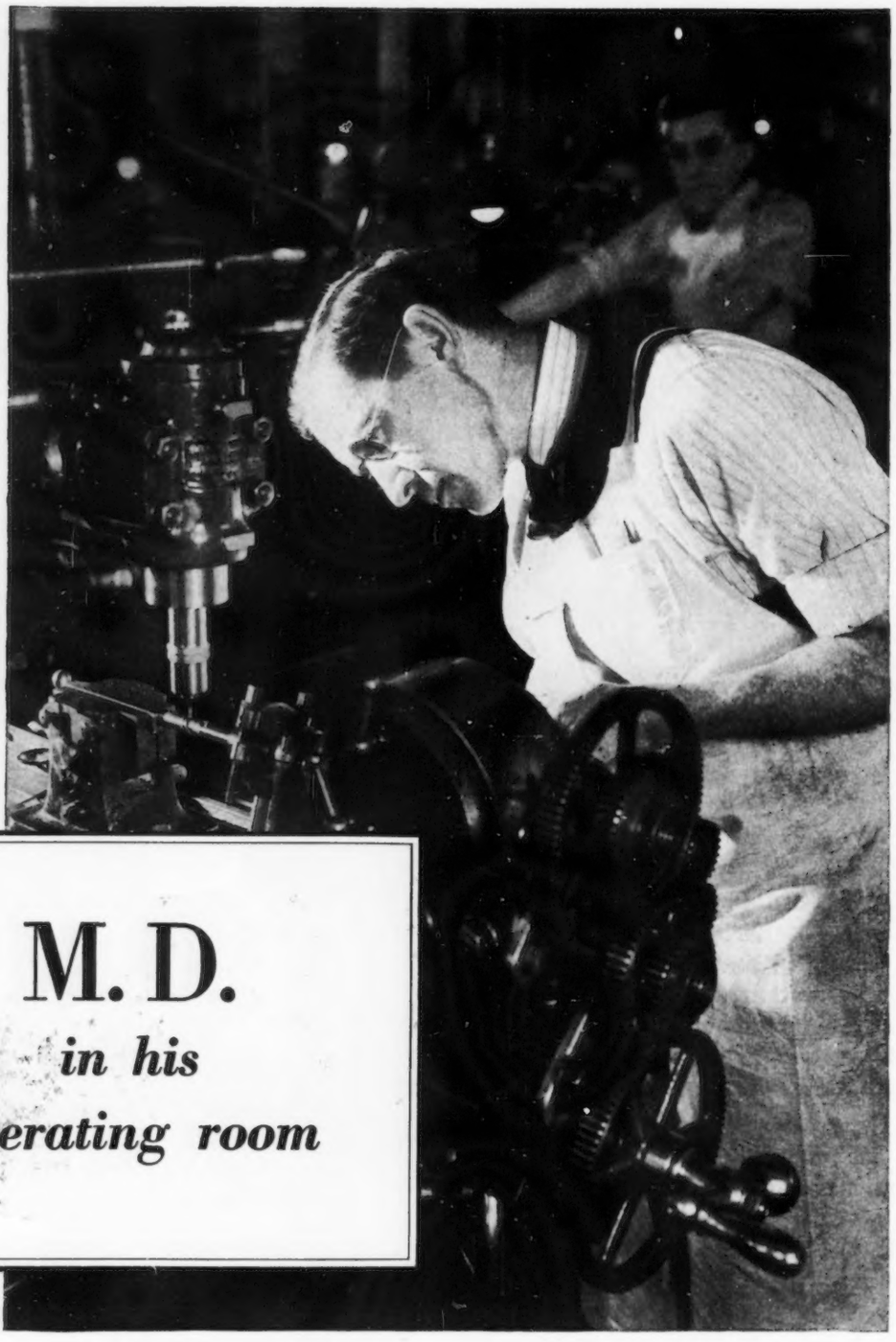
This press, with its unique advances, is but one of the large line of WOOD hydraulic units. WOOD Engineers would be glad to call upon you for a discussion of your press requirements.

ESTABLISHED 1803

R.D. Wood Co.

PHILADELPHIA, PA.

HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE



M. D.
in his operating room

Doctor of Milling would not be an extravagant title for men like this. For they ply the cutters of machine tools as skillfully as surgeons ply their scalpels . . . and their most delicate operations are swift and successful. Long-practiced skill like this is getting scarce these days. But it is available to you here . . . *at reasonable cost* . . . on any type of job you need, large or small, a single unit or a quantity lot. We should like to give you the full picture of the hundreds of men and machines at your disposal here in *your plant in Woonsocket*. You will not obligate yourself in any way by writing to THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND.

TAKE IT TO TAFT-PEIRCE

Tied Together For Economical Backing-Up Insulation

B&W K-16 Insulating Firebrick represent the nearest approach to the ideal insulator, for backing up where interface temperatures do not exceed 2000 F.—because they combine exceptional insulating value with the stability of a fired-clay refractory.

B&W K-16's are made of special Georgia kaolin by a process developed and used exclusively by Babcock & Wilcox. Unequalled by any other insulating material in stability, they retain their structure, show negligible shrinkage, and possess high hot-load-bearing capacity.

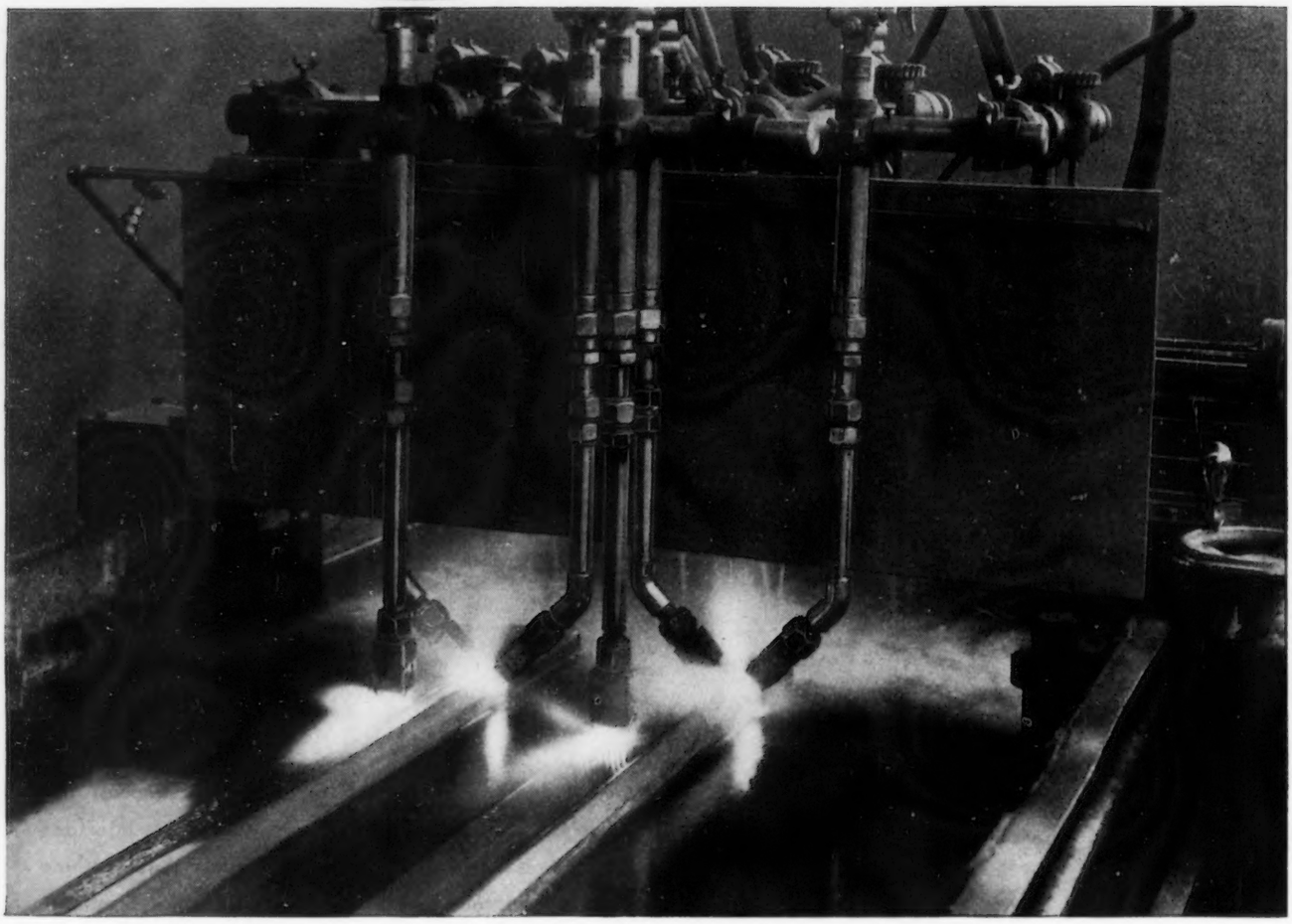
Great stability, tied together with high insulating value, provides significant economies in backing-up insulation. In the case of B&W K-16's, this means savings as high as 40 per cent in the cost of insulating material for a given heat-flow.

Write for new Bulletin R-18, which gives engineering data on B&W K-16 Insulating Firebrick.

THE BABCOCK & WILCOX COMPANY
REFRACTORIES DIVISION: 85 LIBERTY ST., NEW YORK, N. Y.

BABCOCK & WILCOX

STEEL CASTINGS WEAR LONGER when AIRCO Flame Hardened



Airco Oxyacetylene Flame Hardening this cast lathe bed enabled the Monarch Machine Tool Company, Sidney, Ohio, to solve the problem of bed wear permanently. As a result, Monarch Lathes now last longer; need fewer repairs.

The grain structure of the entire flame hardened area is greatly refined and condensed. This is accomplished without materially affecting the physical properties of the core metal. Thus, flame hardened castings retain their original toughness and have the added quality of providing surfaces capable of withstanding severe wear. » » » The facilities of Airco's Applied Engineering Department are available to assist Airco customers solve problems involving surface wear. Write for full details.

AIR REDUCTION

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y., DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO *Anything and Everything for* GAS WELDING or CUTTING and ARC WELDING WILSON

Products Index

WHO MAKES IT

Here you find a weekly listing of hundreds of products with the names and addresses of manufacturers. The advertisements of these companies appear in The Iron Age.

ABRASIVE CLOTH & PAPER
Norton Co., Worcester, Mass.

ABRASIVE WHEELS — See Grinding Wheels

ABRASIVES—Steel Shot and Grit
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.
Steel Shot & Grit Co., Boston, Mass.

ACCESSORIES—Welding
Lincoln Electric Co., The, Cleveland.

ACCUMULATORS—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

ACETYLENE—Dissolved in Cylinders & Small Tanks
Air Reduction, 60 East 42nd St., N.Y.C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

ACID-PROOF CEMENT
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ACIDS—Pickling
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

AIR CONDITIONING EQUIPMENT
American Blower Corp., 6000 Russell St., Detroit, Mich.

ALLOYS—Copper
American Brass Co., The, Waterbury, Conn.
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ALLOYS—Corrosion & Abrasion Resistant
Wall-Colmonoy Corp., Detroit, Mich.

ALLOYS—Ferro
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

ALLOYS—Magnesium
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ALLOYS—Zinc For Die Castings
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ALLOYS—Tungsten
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALLOYS—VANADIUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

ALUMINUM
Aluminum Co. of America, Pittsburgh.

AMMETERS & VOLTMETERS
General Electric Co., Schenectady, N. Y.

AMMETERS AND VOLTMETERS—Recording
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

AMMONIA RECOVERY PLANTS
Koppers Co., Engineering & Construction Div., Pittsburgh.

ANGLES, BEAMS, CHANNELS AND TEES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

ANGLES, BEAMS, CHANNELS & TEES —Magnesium Alloys
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

ANNEALING—See Heat Treating

ANNEALING BOXES
Lebanon (Pa.) Steel Foundry.
United Engineering & Fdry. Co., Pgh.

ANODES—Lead
National Lead Co., 111 Bdway., N. Y. C.

APPAREL—Welding
Lincoln Electric Co., The, Cleveland.

ARBORS
Cincinnati (Ohio) Milling Mch. Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

ARRESTERS—Spark
Harrington & King Perforating Co., Chicago.

ASBESTOS
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St., N. Y. C.

AXLES—Car or Locomotive
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BABBITT METALS
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Co., Philadelphia.
National Lead Co., 111 Bdway., N. Y. C.

BALANCING MACHINES — Static Dynamic
Gisholt Machine Co., Madison, Wis.

BALING PRESSES—Scrap — See Presses —Baling

BALLS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Hartford (Conn.) Steel Ball Co., The.

BALLS—Steel, Brass or Bronze
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hartford (Conn.) Steel Ball Co., The.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BANDS—Steel
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARRELS—Burnishing
Abbott Ball Co., The, 1047 New Britain Ave., Hartford, Conn.

BARRELS—Tumbling
Baird Mch. Co., The, Bridgeport, Conn.
Hartford (Conn.) Steel Ball Co., The.
Whiting Corp., Harvey, Ill.

BARS—Alloy
Midvale Co., The, Nicetown, Phila., Pa.
Republic Steel Corp., Cleveland, Ohio.

BARS—Aluminum
Aluminum Co. of America, Pittsburgh.

BARS—Brass, Bronze or Copper
Bunting Brass & Bronze Co., Toledo, Ohio.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BARS—Cold Drawn
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

BARS—Concrete, Reinforcing
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Nicetown Plate Washer Co., Inc., Philadelphia.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

BARS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.

Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

BARS—Rustless
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

BARS—Steel
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Ecorse, Detroit
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Wisconsin Steel Co., Chicago, Ill.
Youngstown (Ohio) Sheet & Tube Co., The

BATTERIES—Storage
Electric Storage Battery Co., The, Phila.
Philco, Battery Div., Phila., Pa.

BATTERY CHARGERS
Cutler-Hammer, Inc., Milwaukee.

BEAMS—See Angles, Beams, Channels and Tees

BEARINGS—Babbitt
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.

BEARINGS—Ball
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., Poughkeepsie, N. Y.

BEARINGS, Brass and Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.

BEARINGS—Oilless
Bunting Brass & Bronze Co., Toledo, O.
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BEARINGS—Quill
Bantam Bearings Corp., The, South Bend, Ind.

BEARINGS—Radial
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BEARINGS—Roll Neck
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
Link-Belt Co., 519 North Holmes Ave. Indianapolis, Ind.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Roller Tapered
Bantam Bearings Corp., The, South Bend, Ind.
Bower Roller Bearing Co., Detroit, Mich.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Rolling Mill Equipment
Bantam Bearings Corp., The, South Bend, Ind.
Morgan Construction Co., Worcester, Mass.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., The, Canton, O.

BEARINGS—Shaft Hanger
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.

BEARINGS—Thrust
Bantam Bearings Corp., The, South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.
New Departure Div., General Motors Sales Corp., Bristol, Conn.
SKF Industries, Inc., Front St. & Erie Ave., Phila., Pa.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Timken Roller Bearing Co., The, Canton, O.

BELT—Conveyor, Elevator
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

BELTING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BELTING—Metal, Conveyor, High and Low Temperature
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

BELTING—Rubber
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

BELTS—V-Type
Allis-Chalmers Mfg. Co., Milwaukee.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

BENCH LEGS—Steel
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

BENDING MACHINES—Hand, Band and Angle
Excelsior Tool & Mch. Co., E. St. Louis, Ill.

BENDING MACHINES—Hand and Power
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co. The, Steelweld Mchry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Kane & Roach, Inc., Syracuse, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.

BENZOL RECOVERY PLANTS
Koppers Co., Engineering & Construction Div., Pittsburgh.

BERYLLIUM COPPER
American Brass Co., The, Waterbury, Conn.

BILLETS—Alloy
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.

BILLETS—Alloy Steel
Andrews Steel Co., The, Newport, Ky.

BILLETS—Carbon
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BILLETS—Carbon Steel
Andrews Steel Co., The, Newport, Ky.

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Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Chrome Steel
Rustless Iron & Steel Corp., Baltimore, Md.

BILLETS—Forging
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Andrews Steel Co., The, Newport, Ky.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.

BILLETS—Re-rolling
Alan Wood Steel Co., Conshohocken, Pa.
Andrews Steel Co., The, Newport, Ky.

BILLETS—Steel
Bethelhem (Pa.) Steel Company.
Continental Steel Corp., Kokomo, Ind.
Harrisburg (Pa.) Steel Corp.
Jones & Laughlin Steel Corp., Pittsburgh.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wisconsin Steel Co., Chicago, Ill.

BLANKS—Chisel
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82nd St., Cleveland, Ohio.

BLANKS—Gear and Pinion
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

BLAST FURNACE SPECIALTIES
Bailey, Wm. M., Co., Pittsburgh, Pa.

BLAST FURNACES
Brassert, H. A., & Co., Chicago, Ill.

BLAST GATES
Rockwell, W. S., Co., 50 Church St., N.Y.C.

BLOCKS—Chain
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

BLOWERS
American Blower Corp., 6000 Russell St., Detroit, Mich.

BLOWERS—Rotary & Centrifugal
Roots-Connersville Blower Corp., Connersville, Ind.

BLOWPIPES—Oxy-Acetylene Welding & Cutting
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Weldit Acetylene Co., Detroit, Mich.

BLOWPIPES — Soldering, Heating, Annealing
Weldit Acetylene Co., Detroit, Mich.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

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Landis Machine Co., Inc., Waynesboro, Pa.
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BOLT POINTING MACHINES
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BOLT & RIVET CLIPPERS
Helwig Mfg. Co., St. Paul, Minn.

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Bethlehem (Pa.) Steel Company.
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS—Special
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS—Special, Hot or Cold Upset
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BOLTS—Stove
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Progressive Mfg. Co., Torrington, Conn.

BOLTS—Stove, Recessed Head
American Screw Co., Providence, R. I.

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

BOLTS AND NUTS
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Bethlehem (Pa.) Steel Company.
Clark Bros. Bolt Co., Millidale, Conn.
Cleveland (Ohio) Cap Screw Co., The.
Erie (Pa.) Bolt & Nut Co.
Lamson & Sessions Co., The, Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS AND NUTS—Self Locking
Lamson & Sessions Co., The, Cleveland.

BORING BARS
Bullard Co., The, Bridgeport, Conn.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.

BORING, DRILLING & MILLING MACHINES—Horizontal
Giddings & Lewis Machine Tool Co., Fond Du Lac, Wisc.
Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
Lucas Machine Tool Co., Cleveland.
National Automatic Tool Co., Richmond, Ind.
Ohio Machine Tool Co., Kenton, Ohio.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

BORING & DRILLING MACHINES—Vertical
Bullard Co., The, Bridgeport, Conn.
Consolidated Machine Tool Corp., Rochester, N. Y.

BORING MACHINES—Diamond & Carbide Tools
Heald Machine Co., Worcester, Mass.

BORING MACHINES—Jig
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

BORING MACHINES—Precision
Cimatool Co., The, Dayton, Ohio.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

BORING & TURNING MILLS—Vertical
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Planer Co.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

BRAKE LINING & BLOCKS—Asbestos
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

BRAKES—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Electric & Mechanical
Clark Controller Co., The, Cleveland.
Electric Controller & Mfg. Co., The, Cleveland.

BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

BRAKES—Metal Forming
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machinery Div., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, N. J.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

BRAZING—Electric
Metal Electric Processing Co., The, Toledo, Ohio.

BRICK—Fire Clay
Carborundum Co., The, Niagara Falls, N. Y.
Illinois Clay Products Co., Joliet, Ill.

BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

BRIDGE BUILDERS
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—Movable
Earle Gear & Mch. Co., Philadelphia.

BRIQUETS—Ferroalloy
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

BROACHES
Colonial Broach Co., Detroit.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Milling Mch. Co., The.
Colonial Broach Co., Detroit.
Lucas Machine Tool Co., Cleveland.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

BRONZE FOR DIES
Ampco Metal, Inc., Milwaukee, Wis.

BRONZE—Phosphor
Bunting Brass & Bronze Co., Toledo, Ohio.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

BRUSHES—Machine
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BRUSHES—Wire
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS—Clamshell
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Hayward Co., The, 50 Church St., N. Y. C.
Heyl & Patterson, Inc., Pittsburgh.
Industrial Brownhoist Corp., Bay City, Mich.
Wellman Engineering Co., The, Cleveland

BUCKETS—Electric Motor
Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Orange Peel
Hayward Co., The, 50 Church St., N. Y. C.

BUILDINGS—Steel
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
American Rolling Mill Co., Middletown, Ohio.
Belmont Iron Works, Philadelphia.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Iron & Steel Products, Inc., Chicago.

BULLDOZERS
Ajax Mfg. Co., The, Cleveland, Ohio.
Cleveland Crane & Engineering Co., The Steelweld Machinery Div., Wickliffe, Ohio.

BURNERS—Oil or Gas
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

BURNISHING MACHINES—Gear
Cimatool Co., The, Dayton, Ohio.

BURRING MACHINES
Acme Machinery Co., The, Cleveland.
Cimatool Co., The, Dayton, Ohio.
National Broach & Machine Co., Detroit, Mich.

BUSHINGS—Bronze
Ampco Metal, Inc., Milwaukee, Wis.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., 505 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, Ohio.

BUSHINGS—Drill Jig
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

BUSHINGS—Oilless
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

BUSHINGS—Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio.

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Koppers Co., Engineering & Construction Div., Pittsburgh.

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General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., The, Cleveland.

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Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CAMS
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Hardie Brothers Co., Pittsburgh, Pa.

CARBIC
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

CARBIDE—Boron
Norton Co., Worcester, Mass.

CARBIDES—Cemented
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.

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CARS—Railway
Iron & Steel Products, Inc., Chicago.

CARS—Industrial and Mining
Heyl & Patterson, Inc., Pittsburgh.

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CASTERS
Darnell Corp., Ltd., Long Beach, Calif

CASTINGS—Acid or Heat Resisting
Ampco Metal, Inc., Milwaukee, Wis.
Cramp Brass & Iron Foundries Co., Philadelphia.
Duraloy Co., The, Scottdale, Pa.
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.
Hoskins Mfg. Co., Detroit, Mich.
Lebanon (Pa.) Steel Foundry.
Meehanite Research Institute, Pittsburgh Pa.
Michiana Products Corp., Michigan City, Ind.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
Michiana Products Corp., Michigan City, Ind.

CASTINGS—Alloy Steel
Advance Foundry Co., The, Dayton, Ohio.
Hartford (Conn.) Electric Steel Corp.
Lebanon (Pa.) Steel Foundry.
Mackintosh-Hemphill Co., Pittsburgh
Michiana Products Corp., Michigan City, Ind.
National-Erie Corp., Erie, Pa.

CASTINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Brass, Bronze, Copper or Aluminum
Bunting Brass & Bronze Co., The, Toledo, Ohio.
Cadman, A. W., Mfg. Co., Pittsburgh.
Cramp Brass & Iron Foundries Co., Philadelphia.
National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—Bronze
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CASTINGS—Corrosion Resisting
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Research Institute, Pittsburgh, Pa.
Michiana Products Corp., Michigan City, Ind.
Midvale Co., The, Nicetown, Phila., Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Wall-Colmonoy Corp., Detroit, Mich.

CASTINGS—Die, Aluminum
Aluminum Co. of America, Pittsburgh.

CASTINGS—Electric Steel
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Crucible Steel Castings Co., Lansdowne, Pa.
Lebanon (Pa.) Steel Foundry.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—Gray Iron
Advance Foundry Co., The, Dayton, Ohio.
American Engineering Co., Philadelphia.
Cramp Brass & Iron Foundries Co., Philadelphia.
Kline Hardware Co., Allentown, Pa.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lobdell Car Wheel Co., Nazel Hammer Div., Wilmington, Del.
National Roll & Fdry. Co., Avonmore, Pa.
North Wales (Pa.) Mach. Co., Inc.
Spencer's, I. S., Sons, Inc., Guilford, Ct.
Vilter Mfg. Co., The, 2140 So. First St., Milwaukee, Wis.

CASTINGS—High Test & Alloy Iron
Cramp Brass & Iron Foundries Co., Philadelphia.
Meehanite Research Institute, Pittsburgh, Pa.

CASTINGS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

CASTINGS—Malleable
Lake City Malleable Co., The, 5100 Lakeside Ave., Cleveland.
Peoria (Ill.) Malleable Castings Co.

CASTINGS—Manganese, Steel and Alloy
Pettibone Mulliken Corp., Chicago.

CASTINGS—Meehanite Metal
Meehanite Research Institute, Pittsburgh, Pa.

CASTINGS—Monel & Nickel
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Semi-Steel
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—Steel
American Rolling Mill Co., Middletown, Ohio.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Crucible Steel Castings Co., Lansdowne, Pa.
Hartford (Conn.) Electric Steel Corp.
Lebanon (Pa.) Steel Foundry.
Mackintosh-Hemphill Co., Pittsburgh
Mesta Mch. Co., Pittsburgh.
Michiana Products Corp., Michigan City, Ind.
National-Erie Corp., Erie, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Standard Steel Wks. Co., Phila., Pa.
Steel Founders' Society of America, Cleveland.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS—Wear Resisting
Meehanite Research Institute, Pittsburgh, Pa.
Wall-Colmonoy Corp., Detroit, Mich.

CEMENT—Acid-Proof
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CEMENT—Refractory
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Carborundum Co., The, Perth Amboy, N. J.
Johns-Manville Corp., 22 East 40th St., New York City.

CENTER LAPPING MACHINES
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

CENTERING MACHINES
Jones & Lamson Machine Co., Springfield, Vt.

CHAINS—Conveyor & Elevator
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

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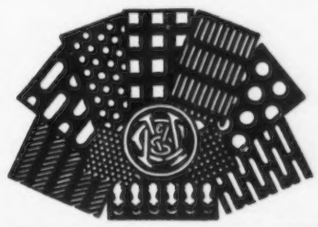

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CHAINS—Power Transmission
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Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Co., 519 North Holmes Ave., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y.
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CHAINS—Silent
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Heald Machine Co., Worcester, Mass.
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CIRCLES—Phosphor Bronze
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

CLAY GUNS
Bailey, Wm. M., Co., Pittsburgh, Pa.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B., Sales Co., The, Wyandotte, Mich.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

CLEANING EQUIPMENT (METAL)—Electro-Chemical
Bullard Co., The, Bridgeport, Conn.

CLEANING EQUIPMENT—Metal
Detroit Rex Products Co., Detroit, Mich.

CLOTHING—Asbestos & Fireproof
American Optical Co., Southbridge, Mass.

CLUTCH-BRAKES—Magnetic
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.
Morse Chain Co., Ithaca, N. Y.

CLUTCHES—Friction
Dodge Mfg. Corp., Mishawaka, Ind.

CLUTCHES—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES—Overrunning
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Koppers Coal Co., The, Pittsburgh.

COAL, ORE & ASH HANDLING MACHINERY
Alvey-Ferguson Co., The, 700 Disney St., Cincinnati, Ohio.
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

COBALT METAL
Central Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—Lead
National Lead Co., 111 Bdway., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.

COKE OVEN MACHINERY
Koppers Co., Engineering & Construction Div., Pittsburgh.

COLD ROLL FORMING MACHINES
Kane & Roach, Inc., Syracuse, N. Y.
McKay Machine Co., The, Youngstown, Ohio.

COLLETS—Drill
Apex Machine & Tool Co., The, Dayton, Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing and Cutting
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Standard Oil Co. (Indiana), Chicago.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPOUNDS—Lapping
National Broach & Machine Co., Detroit, Mich.

COMPRESSORS—Air
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

COMPRESSORS—Rebuilt. (See Clearing House Section)

CONDENSERS—Surface & Jet
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONTACTS—Electrical
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROL SYSTEMS—Temperature
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLLERS—Crane
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Cutler-Hammer, Inc., Milwaukee.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLS—Time Cycle
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CONVEYING AND ELEVATING MACHINERY
Alvey-Ferguson Co., The, 700 Disney St., Cincinnati, Ohio.
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Gravity
Alvey-Ferguson Co., The, 700 Disney St., Cincinnati, Ohio.
Logan Co., Inc., Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.

CONVEYORS—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

COOLERS—For Cutting Oils
Harrison Radiator Div. General Motors Corp., Lockport, N. Y.

COPING MACHINES
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh, Pa.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Lamson & Sessions Co., The, Cleveland.
Western Wire Prods. Co., St. Louis, Mo

COUNTERBORES
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
Gairing Tool Co., Detroit
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Streeter-Amet Co., Chicago.
Veeder-Root, Inc., Hartford, Ct.

COUNTING MACHINES
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-Off Friction
Hilliard Corp., The, Railroad Ave., Elmira, N. Y.

COUPLINGS—Flexible
Ajax Flexible Coupling Co., Westfield, N. Y.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
James, D. O., Mfg. Co., Chicago, Ill.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Poole Foundry & Mch. Co., Baltimore, Md.

COUPLINGS—Pipe
Champion Machine & Forging Co., The, Cleveland, Ohio.
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Pittsburgh.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Cleveland Crane & Engineering Co. Wickliffe, Ohio.
Dravo Corp., Engineering Wks. Div. Pittsburgh.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div. Manning Maxwell & Moore, Inc., 402 Broadway Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
American Monorail Co., The, Cleveland.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Jib
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Whiting Corp., Harvey, Ill.

CRANES—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.
Ohio Locomotive Crane Co., The, Bucyrus, O.

CRANES—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Canton Fdry. & Mch. Co., Cleveland.

CRANES—Portable Electric
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANKSHAFTS
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

CRANKSHAFTS—Forged
Bay City Forge Co., Erie, Pa.
Midvale Co., The, Nicetown, Phila., Pa.

CRUSHERS—Coal
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CRUSHERS—Steel Turning
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CUPOLA CHARGING EQUIPMENT
Atlas Car & Mfg. Co., The, Cleveland, Ohio.

CUTTERS & BURRS—Diemakers'
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

CUTTERS—Die Sinking
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.

CUTTERS—Grinding Wheel—see Dressers—Grinding Wheel

CUTTERS—Keyseating
Davis Keyseater Co., 400 Exchange St. Rochester, N. Y.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Gairing Tool Co., The, Detroit.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

CUTTING-OFF MACHINES—Abrasives
Tabor Mfg. Co., Phila.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.

CUTTING-OFF MACHINES—Pipe or Tubing
Bardons & Oliver, Inc., Cleveland.
Cox & Sons Co., The, Bridgeton, N. J.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING AND WELDING APPARATUS —Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene.

CYLINDERS — Compressed Air & Hydraulic
Hannifin Mfg. Co., Chicago, Ill.
Tomkins-Johnson Co., The, Jackson, Mich.

CYLINDERS—Seamless
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp Subsidiary), Pittsburgh.

DEGREASING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

DEGREASING MACHINES—Solvent
Detroit Rex Products Co., Detroit, Mich.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

DESIGNING & DEVELOPING
Torrington (Conn.) Mfg. Co., The.

Products Index

DIE BLOCKS—Drop Hammer
Heppenstall Co., Pittsburgh, Pa.

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE—Hard Carbide Inserts
McKenna Metals Co., Latrobe, Pa.

DIE SINKING MACHINES — Automatic and Hand
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.

DIES, JIGS, FIXTURES, etc.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

DIES—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.

DIES—Drawing & Sizing
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.

DIES—Pipe Threading
Acme Machinery Co., The, Cleveland.
Greenfield (Mass.) Tap & Die Corp.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit Mich.
National Acme Co., The, Cleveland.

DIES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

DIES—Screw and Thread Cutting
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., The, Cleveland, Ohio.

DIES—Sheet Metal Working
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Cimatool Co., The, Dayton, Ohio.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

DIES—Steel Letters and Stamps
Cunningham, M. E., Co., Pittsburgh, Pa.

DIESEL FUEL INJECTORS
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

DOORS & SHUTTERS, Fireproof
Kinnear Mfg. Co., Columbus, Ohio.

DOORS & SHUTTERS — Steel or Wood Rolling
Kinnear Mfg. Co., Columbus, Ohio.
Mahon, R. C., Co., Detroit, Mich.

DRAW BENCHES
McKay Machine Co., The, Youngstown, Ohio.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRESSERS—Grinding Wheel
Carboloy Co., Inc., 11153 E. 8-Mile Rd., Detroit, Mich.

DRILL HEADS—Hydraulic
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Bench
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Multiple Spindle
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Multiple Spindle Adjustable
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Multiple Spindle Horizontal
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Portable Electric
Millers Falls Co., Greenfield, Mass.

DRILLING MACHINES—Portable Pneumatic
Helwig Mfg. Co., St. Paul, Minn.
Warner & Swasey Co., The, Cleveland.

DRILLING MACHINES—Radial
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.

DRILLING MACHINES—Sensitive
Buffalo (N. Y.) Forge Co., 492 Broadway.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Upright
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRILLING MACHINES—Vertical
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRIVES—Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.

DRIVES—Single & Multiple V-Belts
Allis-Chalmers Mfg. Co., Milwaukee.

DROP FORGINGS—See Forgings—Drop Iron or Steel

DROP HAMMERS—See Hammers—Drop

DUPLICATING MACHINES
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

DUST COLLECTORS
Abrasive Machine Tool Co., East Providence, R. I.
American Blower Corp., 6000 Russell St., Detroit, Mich.
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Mahon, R. C., Co., Detroit, Mich.
Pangborn Corporation, Hagerstown, Md.
Whiting Corp., Harvey, Ill.

ECONOMIZERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

ELECTRIC LIGHTING—Industrial
General Electric Co., Lamp Dept., Nela Park, Cleveland.

ELECTRIC WELDING — See Welding — Electric

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee.

ELECTRICAL MACHINERY — Second Hand. (See Clearing House Section)

ELECTRICAL WIRES
Roebling's, John A., Sons Co., Trenton, N. J.

ELECTRODE HOLDERS—Welding
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.

ELECTRODES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ELECTRODES—Welding, Coated
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.

ELECTROPLATING EQUIPMENT & SUPPLIES
Hobart Bros., Troy, Ohio.
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

ELEVATORS—Material Handling
Link-Belt Co., 300 West Pershing Road, Chicago.

EMERY WHEELS—See Grinding Wheels

ENAMELS
American Asphalt Paint Co., Chicago, Ill.

ENGINEERS—Consulting and Industrial
Koppers Co., Engineering & Construction Div., Pittsburgh.
Lindemuth, Lewis B., 134 East 47th St., N. Y. C.
Pioneer Engineering & Mfg. Co., Detroit.

ENGINES—Diesel
Diesel Engine Div. General Motors Sales Corp., Cleveland.

EYELET MACHINES
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

FACING CLAY
Carborundum Co., The, Perth Amboy, N.J.

FACING MACHINES—Precision
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

FACTORY & PLANT SITES
Zoll, Edward H., 196 Market St., Newark, N. J.

FANS—Ventilating
American Blower Corp., 6000 Russell St., Detroit, Mich.
Buffalo (N. Y.) Forge Co., 492 Broadway.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Steel Corp.

FEEDS—Hydraulic, for Machines
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

FELT—Wool Mechanical
American Felt Co., 315 Fourth Ave., N.Y.C.

FENCING—Wire
Pittsburgh (Pa.) Steel Co.

FENDERS—Rolled Crowned
Stolper Steel Products Corp., Milwaukee, Wis.

FERROALLOYS
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

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Products Index

FERROMANGANESE
Bethlehem (Pa.) Steel Company.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Jones & Laughlin Steel Corp., Pittsburgh.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank & Co., Inc., Philadelphia.

FERROMOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

FERROSILICO MANGANESE
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON
Cleveland-Cliffs Iron Co., The, Cleveland Ohio.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON ALUMINUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSPIEGELEISEN
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

FERROTITANIUM
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E 42nd St., N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FIBRE—Sheets, Tubes, Rods, Fabricated Parts
Continental-Diamond Fibre Co., Newark, Delaware.

FILES & RASPS
Atkins, E. C. & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Nicholson File Co., Providence, R. I.

FILING MACHINES
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 22 East 40th St. New York City.

FILTERS—Air
Whiting Corp., Harvey, Ill.

FILTERS—Oil
National Acme Co., The, Cleveland.

FIRE BRICK
Babcock & Wilcox Co., The, 85 Liberty St., New York City.

FIRE BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

FIRE CLAY
Carborundum Co., The, Perth Amboy, N. J.
Illinois Clay Products Co., Joliet, Ill.
Commonwealth Brass Corp., Detroit.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit, Mich.

FITTINGS—Welding
Crane Co., Chicago, Ill.

FLANGES—Forged Steel
Harrisburg (Pa.) Steel Corp.
Standard Steel Wks. Co., Phila., Pa.

FLANGES—Welded Steel
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

FLANGING WORK—Carbon and Alloy
Worth Steel Co., Claymont, Del.

FLEXIBLE SHAFT EQUIPMENT
Lovejoy Flexible Coupling Co., 4979 Lake St., Chicago, Ill.
Strand, N. A. & Co., Chicago.

FLOODLIGHTS—Acetylene
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FLOOR PLATES—See Plates—Floor or Cellar Door

FLOORING—Hard Mastic
Permaflex Products Co., Philadelphia, Pa.

FLOORING—Monolithic
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St New York City.

FLOORING—Open Steel
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh, Pa.
Dravo Corp., Engineering Wks. Div., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.

FLUORSPAR
Hillside Fluor Spar Mines, 38 S. Dearborn St., Chicago, Ill.

FLUX—Soldering (Stainless Steel)
Ruby Chemical Co., Columbus, Ohio.

FLUX—Welding
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FORGING MACHINES—Roll
Ajax Mfg. Co., The, Cleveland, Ohio.

FORGING MACHINES—Upset
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Cleveland, Ohio.

FORGINGS—Alloy Steel
Heppenstall Co., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

FORGINGS—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Co., Philadelphia.
Harvey Metal Corp., The, Chicago, Ill.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Champion Machine & Forging Co., The, Cleveland, Ohio.
Herbrand Corp., The, Fremont, Ohio.
Poor & Co., Canton Forge & Axle Wks., Canton, Ohio
Rockford (Ill.) Drop Forge Co.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.
Williams, J. H., & Co., Buffalo, N. Y.

FORGINGS—Hammered
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Hollow
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Bethlehem (Pa.) Steel Company.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa
Standard Steel Wks. Co., Phila., Pa.

FORGINGS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

FORGINGS—Tool Steel
Vulcan Steam Forging Co., Buffalo, N. Y.

FORGINGS—Upset
Bethlehem (Pa.) Steel Company.
Lamson & Sessions Co., The, Cleveland.
Rockford (Ill.) Drop Forge Co.
Standard Tube Co., The, Detroit, Mich.

FOUNDRY EQUIPMENT & SUPPLIES
Whiting Corp., Harvey, Ill.

FURNACES—Billet or Ingot Heating
Salem (Ohio) Engineering Co.
Wean Engineering Co., Inc., Warren, Ohio.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Detroit Electric Furnace Div. Kuhlman Electric Co., Bay City, Mich.
Pittsburgh (Pa.) Lectromelt Furnace Corp.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.
General Electric Co., Schenectady, N. Y.

FURNACES—Forging
Holcroft & Co., Detroit.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Heat Treating, Automatic
Holcroft & Co., Detroit.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Heat Treating, Controlled Atmosphere
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.

FURNACES—Heat Treating, Cyanide or Lead
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Electric
General Electric Co., Schenectady, N. Y.
Holcroft & Co., Detroit.
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Salem (Ohio) Engineering Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES—Heat Treating, Oil or Gas
Holcroft & Co., Detroit.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Pennsylvania Industrial Engineers, Pittsburgh.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.
Wean Engineering Co., Inc., Warren, Ohio.

FURNACES—Non-Ferrous Melting
Detroit Electric Furnace Div. Kuhlman Electric Co., Bay City, Mich.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.

FURNACES—Open Hearth, Consultant
Lindemuth, Lewis B., 134 East 47th St., N. Y. C.

FURNACES—Pack Heating Sheets
Wean Engineering Co., Inc., The, Warren, Ohio.

FURNACES—Rivet Heating, Gas
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Tempering
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.

FURNACES—Wire, Annealing and Galvanizing
General Electric Co., Schenectady, N. Y.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

GAGE BLOCKS
Ford Motor Co. (C. E. Johansson Division), Dearborn, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GAGES—Electric
Sheffield Gage Corp., Dayton, Ohio.

GAGES—Plug and Snap
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

GAGES—Sheet Thickness
Streeter-Amet Co., Chicago.

GAGES—Surface
Millers Falls Co., Greenfield, Mass.

GAGES—Thickness Automatic
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

GAGES—Thickness, for Rolling Mills
Haines Gauge Co., The, Phila., Pa.

GAGES—Thread Lead
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Sheffield Gage Corp., Dayton, Ohio.

GALVANIZED IRON PRIME COATING
American Chemical Paint Co., Ambler, Pa.

GALVANIZING
American Hot Dip Galvanizers Ass'n, Inc., Pittsburgh.
Cattie, Joseph P., & Bros., Phila.
Enterprise Galvanizing Co., Philadelphia.
Southern Galvanizing Co., Baltimore, Md.

GALVANIZING COMPOUNDS
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

GALVANIZING PLANTS—For Sheets
Erie (Pa.) Foundry Co.

GAS ANALYSIS RECORDERS
Leeds & Northrup Co., 4956 Stenton Ave. Philadelphia.

GAS—Boosters & Exhausters
Roots-Connersville Blower Corp., Connersville, Ind.

GAS FOR INDUSTRIAL USES
American Gas Association, 420 Lexington Ave., N. Y. C.

GAS PRODUCERS
Koppers Co., Engineering & Construction Div., Pittsburgh.
Morgan Construction Co., Worcester, Mass.

GASKETS—Asbestos, Metal or Rubber
Garlock Packing Co., The, Palmyra, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

GEAR CHECKING EQUIPMENT
Michigan Tool Co., Detroit, Mich.

GEAR CUTTING
Earle Gear & Machine Co., Phila.
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.
Hartford (Conn.) Special Machinery Co. The.
James, D. O., Mfg. Co., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Waltham (Mass.) Watch Co.

GEAR CUTTING MACHINES
Farrel-Birmingham Co., Inc., Buffalo, N.Y.
Gleason Works, Rochester, N. Y.

GEAR DRIVES—Herringbone
Continental Roll & Steel Foundry Co., East Chicago, Ind.
James, D. O., Mfg. Co., Chicago, Ill.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

GEAR HOBBING MACHINES
Barber-Colman Co., Rockford, Ill.

GEAR LAPPING MACHINES
Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

GEARMOTORS
Allis-Chalmers Mfg. Co., Milwaukee.
General Electric Co., Schenectady, N. Y.
James, D. O., Mfg. Co., Chicago, Ill.
Westinghouse Elec. & Mfg. Co., East Ptgh.

GEAR PLANING MACHINES
Gleason Works, Rochester, N. Y.

GEAR SHAVING MACHINES
Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.

GEAR TESTING MACHINES
National Broach & Machine Co., Detroit, Mich.

GEARS—Bevel
Gleason Works, Rochester, N. Y
James, D. O., Mfg. Co., Chicago, Ill.
National-Erie Corp., Erie, Pa.

GEARS—Heat Treated
Gleason Works, Rochester, N. Y.
James, D. O., Mfg. Co., Chicago, Ill.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Herringbone
Farrel-Birmingham Co., Inc., Buffalo, N.Y
James, D. O., Mfg. Co., Chicago, Ill.
Mesta Mch. Co., Pittsburgh.

GEARS—Machine Cut
Gleason Works, Rochester, N. Y.
James, D. O., Mfg. Co., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Machine Molded
Poole Foundry & Mch. Co., Baltimore, Md.

GEARS—Non-Metallic
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Continental-Diamond Fibre Co., Newark, Delaware.
James, D. O., Mfg. Co., Chicago, Ill.

GEARS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

GEARS—Spur
James, D. O., Mfg. Co., Chicago, Ill.
Simonds Gear & Mfg. Co., Pittsburgh.

GEARS—Teeth Ground
Hartford (Conn.) Special Machinery Co., The.

GEARS—Worm
Cone Worm Gear Div., Michigan Tool Co., Detroit, Mich.
James, D. O., Mfg. Co., Chicago, Ill.

GENERATORS—Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

GENERATORS—Electric
General Electric Co., Schenectady, N. Y
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh

GENERATORS—Electric, Second Hand. (See Clearing House Section)

GLOVES—Asbestos & Fireproof
American Optical Co., Southbridge, Mass.

GOGGLES—Safety
American Optical Co., Southbridge, Mass.

GOVERNORS—Air Compressor
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

GRATING—Flooring, Sidewalk, etc.—See Flooring—Open Steel

GREASE—Lubricating
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

GRILLES—Metal Cane
Diamond Mfg. Co., Wyoming, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

GRILLES—Perforated Metal
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

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GRINDERS—Carbide Tool
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

GRINDING
Defiance Screw Mch. Prods. Div. of The Serrick Corp., Defiance, Ohio.

GRINDING AND POLISHING MACHINES
Bryant Machinery & Engineering Co., Chicago.
Excelsior Tool & Mch. Co., E. St. Louis, Ill
Norton Co., Worcester, Mass.

GRINDING MACHINES—Centerless
Cincinnati (Ohio) Grinders Incorporated.
Leahy, John W., Danbury, Conn.

GRINDING MACHINES—Chucking
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING MACHINES — Cutter & Reamer
Cincinnati (Ohio) Milling Mch. Co., The.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Machine Tool Co., Cincinnati.

GRINDING MACHINES—Cylinder
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Cylindrical
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati (Ohio) Grinders Incorporated.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES—Die
Landis Mch. Co., Inc., Waynesboro, Pa.

GRINDING MACHINES—Drill
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

GRINDING MACHINES—Gear & Worm
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Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal Centerless
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES—Internal Multiple Spindle
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GRINDING MACHINES—Portable Electric
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.
Millers Falls Co., Greenfield, Mass.

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Strand, N. A., & Co., Chicago.

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GRINDING MACHINES—Precision Thread
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.
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GRINDING MACHINES—Roll
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Farrel-Birmingham Co., Inc., Ansonia, Conn.
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Norton Co., Worcester, Mass.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

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Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
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Macklin Company, Jackson, Mich.
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Norton Co., Worcester, Mass.

GRINDING WHEELS—Mounted, Pencil
Chicago (Ill.) Wheel & Mfg. Co., 1101 W. Monroe St.

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Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.

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Irwin, H. G., Lumber Co., Erie, Pa.

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HAMMERS—Machinists'
Usher Mfg. Co., Inc., 135 Tonawanda St., Buffalo, N. Y.

HAMMERS—Power
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

HAMMERS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., 1306 Elston Ave.

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Fafnir Bearing Co., New Britain, Conn.
S K F Industries, Inc., Front St. & Erie Ave., Phila., Pa.

HANGERS—Roller Bearing
Hyatt Bearings Div. General Motors Sales Corp., Harrison, N. J.

HANGERS—Shaft
Dodge Mfg. Corp., Mishawaka, Ind.

HEADING MACHINES
Ajax Mfg. Co., The, Cleveland, Ohio.

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Waterbury (Conn.) Farrel Foundry & Machine Co., The.

HEADS—Spun and Pressed
Emerson-Scheuring Tank Co., Indianapolis, Ind.
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Bodges, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
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Parish Pressed Steel Co., Reading, Pa.
Pennsylvania Industrial Engineers, Pittsburgh.
United Shank & Findings Co., Whitman, Mass.
Vulcan Steam Forging Co., Buffalo, N. Y.

HEATERS—Unit
Dravo Corp., Engineering Wks. Div., Pittsburgh.

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Northern Engineering Works, Detroit.

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Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

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Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Detroit (Mich.) Hoist & Mach. Co.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, Detroit, Mich.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

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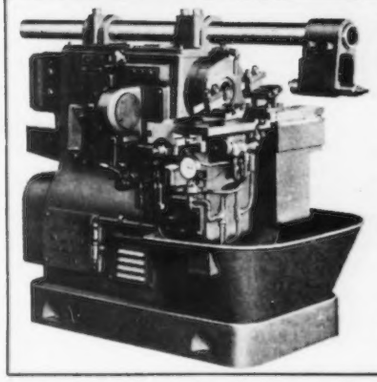

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Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
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Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

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HOUSINGS—Engine & Machine
Stolper Steel Products Corp., Milwaukee, Wis.

HYDRAULIC MACHINERY
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
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Farquhar, A. B., Co., Ltd., York, Pa.
Hannifin Mfg. Co., Chicago, Ill.
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Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

HYDRAULIC POWER UNIT
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

INGOT MOLDS
Shenango-Penn Mold Co., Dover, Ohio.
Valley Mould & Iron Corp., Hubbard, Ohio.

INGOTS—Aluminum
Aluminum Co. of America, Pittsburgh.

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Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

INSULATING MATERIALS—Electrical
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INSULATION
Illinois Clay Products Co., Joliet, Ill.
Johns-Manville Corp., 22 East 40th St., New York City.

IRON—Genuine Open Hearth Iron
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IRON WORKERS—Universal
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Western Wire Prods. Co., St. Louis, Mo.

KEYSEATING MACHINES
Davis Keyseater Co., 400 Exchange St., Rochester, N. Y.

LACING—Belt, Rawhide or Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LAMPS—Filament
General Electric Co., Lamp Dept., Nela Park, Cleveland.
Westinghouse Electric & Mfg. Co., Lighting Div., Cleveland, Ohio.

LAMPS—Mercury Vapor
General Electric Co., Lamp Dept., Nela Park, Cleveland.

LAPPING MACHINES
Cincinnati (Ohio) Grinders Incorporated.

LATHE ATTACHMENTS
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Automatic
Baird Mch. Co., The, Brideport, Conn.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Goss & De Leeuw Mch. Co., New Britain, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Cincinnatti.
Monarch Mch. Tool Co., The, Sidney, O.
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LATHES—Automatic Vertical
Baird Mch. Co., The, Bridgeport, Conn.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.

LATHES—Bench
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Brass
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Machine Co., Springfield, Vt.
South Bend (Ind.) Lathe Works, 587 East Madison St.
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LATHES—Car-Wheel
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

LATHES—Chucking
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
South Bend (Ind.) Lathe Works, 587 East Madison St.
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Monarch Mch. Tool Co., The, Sidney, O.

LATHES—Crankshaft
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Potter & Johnston Machine Co., Pawtucket, R. I.

LATHES—Engine
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Lathe & Tool Co.
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Hill-Clarke Mchry. Co., 647 W. Washington Blvd., Chicago.
LeBlond, R. K., Mch. Tool Co., Cincinnati.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—High Speed
Hendey Machine Co., Torrington, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Roll
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mesta Mch. Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

LATHES — Second-Hand. (See Clearing House Section)

LATHES—Toolroom
Cincinnati (Ohio) Lathe & Tool Co.
LeBlond, R. K., Machine Tool Co., Cincinnati, Ohio.
Monarch Mch. Tool Co., The, Sidney, O.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.
South Bend (Ind.) Lathe Works, 587 East Madison St.

LATHES—Turret
Acme Machine Tool Co., The, Cincinnati, Ohio.
Bardons & Oliver, Inc., Cleveland.
Bullard Co., The, Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Mch. Co., Springfield, Vt.
Potter & Johnston Machine Co., Pawtucket, R. I.
South Bend (Ind.) Lathe Works, 587 East Madison St.
Warner & Swasey Co., The, Cleveland.

LATHES, Turret, Vertical
Bullard Co., The, Bridgeport, Conn.

LEAD LININGS
National Lead Co., 111 Bdway., N. Y. C.

LEAD—In Oil
National Lead Co., 111 Bdway., N. Y. C.

LEAD—Tellurium
National Lead Co., 111 Bdway., N. Y. C.

LEATHER—Cup
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

LEGGINS—Safety
American Optical Co., Southbridge, Mass.

LEVELING MACHINES
McKay Machine Co., The, Youngstown, Ohio.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Voss, Edward W., Pittsburgh, Pa.
Wean Engineering Co., Inc., The, Warren, O.

LOCOMOTIVES—Diesel
Atlas Car & Mfg. Co., The, Cleveland, Ohio.
Diesel Engine Div. General Motors Sales Corp., Cleveland.

LOCOMOTIVES—Gasoline
Plymouth (Ohio) Locomotive Works Div. Fate-Root-Heath Co.

LOCOMOTIVES—Industrial
Diesel Engine Div. General Motors Sales Corp., Cleveland.
Plymouth (Ohio) Locomotive Works Div Fate-Root-Heath Co.

LOCOMOTIVES—Steam
Iron & Steel Products, Inc., Chicago.

LUBRICANTS—Crusher & Grinding
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Gear
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—High Pressure & Temperature
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mine Cars
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Mining Machines
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Railroad
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Roll Neck—Anti-Friction & Plain
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh, Pa.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 E. 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

LUBRICANTS—Tipple & Cleaning
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco; Shell Bldg., St. Louis, and 50 W. 50th St., N. Y. C.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

MACHINE WORK
Central Machine Works, Worcester, Mass.
General Machine Works, York, Pa.
Hoe, R., & Co., Inc., 910 E. 138th St., New York City
McCulloch Mfg. Co., So. Boston, Mass.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.
Treadwell Engineering Co., Easton, Pa.

MACHINERY DEALERS—Second-Hand (See Clearing House Section)

MACHINISTS' SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.

MAGNESITE—Brick or Dead Burnt
Carborundum Co., The, Perth Amboy, N. J.

MAGNESIUM
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

MAGNETS—Lifting
Cutler-Hammer, Inc., Milwaukee.
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Electric Controller & Mfg. Co., The, Cleve.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.

MAGNETS — Separating—See Separators —Magnetic

MALLETS—Rawhide
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

MANDRELS—Expanding
Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

MANHOLE FITTINGS AND SADDLES
Worth Steel Co., Claymont, Del.

MANIFOLDS—Oxygen & Acetylene
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

METAL CLEANING COMPOUNDS
Detroit Rex Products Co., Detroit, Mich.
Ford, J. B. Sales Co., The, Wyandotte, Mich.
Pennsylvania Salt Mfg. Co., Philadelphia.

METAL SPECIALTIES
Budd, Edward G., Mfg. Co., Philadelphia, Pa.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Crosby Co., The, Buffalo, N. Y.
Mattatuck Mfg. Co., The, 1900 East Main St., Waterbury, Conn.
Southern Products, Independence, Mo.
Torrington (Conn.) Company.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

METERS—Electric Welding
Lincoln Electric Co., The, Cleveland.

METERS—Flow
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

METERS—Gas or Air
Roots-Connersville Blower Corp., Connersville, Ind.

MICROMETERS—Dial for Sheet Metal
Haines Gauge Co., The, Phila., Pa.

MILLING MACHINES—Automatic
Cincinnati (Ohio) Milling Mch. Co., The.
Jones & Lamson Machine Co., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wisc.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Horizontal
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Kearney & Trecker Corp., Milwaukee, Wisc.
Ohio Machine Tool Co., Kenton, Ohio.
Potter & Johnston Machine Co., Pawtucket, R. I.

MILLING MACHINES—Planer Type
Cincinnati (Ohio) Planer Co.
Consolidated Machine Tool Corp., Rochester, N. Y.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

MILLING MACHINES — Second - Hand. (See Clearing House Section)

MILLING MACHINES—Vertical
Brown & Sharpe Mfg. Co., Prov., R. I.
Cincinnati (Ohio) Milling Mch. Co., The.
Kearney & Trecker Corp., Milwaukee, Wisc.
National Broach & Machine Co., Detroit, Mich.
Potter & Johnston Machine Co., Pawtucket, R. I.
Reed-Prentice Corp., Worcester, Mass.

MOLDING MACHINES
Tabor Mfg. Co., Phila., Pa.

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., N. Y. C.

MONEL METAL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

MONORAIL SYSTEMS—Hand & Electric
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

MOTORS—Electric
Allis-Chalmers Mfg. Co., Milwaukee.
Delco Products Div. General Motors Corp., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Howell (Mich.) Electric Motors Co.
Lincoln Electric Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Ptgh.

MOTORS—Electric, Second-Hand. (See Clearing House Section)

NAILS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Youngstown (Ohio) Sheet & Tube Co., The

Products Index

NIBBLING MACHINES
Gray Machine Co., Philadelphia.

NIBS—Lathe & Grinder Center
McKenna Metals Co., Latrobe, Pa.

NICKEL
International Nickel Co., Inc., The, 67 Wall St., N. Y. C.

NITROGEN
Air Reduction, 60 East 42nd St., N. Y. C.

NOZZLES—Sand Blasting
Norton Co., Worcester, Mass.

NUT MACHINERY — Automatic Cold Pressed
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

NUTS—Castellated
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Lock
Elastic Stop Nut Corp., Elizabeth, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

NUTS—Machine Screw
Progressive Mfg. Co., Torrington, Conn.

NUTS—Semi-Finished
Cleveland (Ohio) Cap Screw Co., The.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS—Wing
Parker-Kalon Corp., 200 Varick St., N. Y. C.

OIL & GREASE SEALS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

OIL RETAINERS
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.

OIL STONES
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

OILS—Cutting
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Penola, Inc., Pittsburgh, Pa.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago, Ill.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Fuel
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Standard Oil Co. (Indiana), Chicago, Ill.
Sun Oil Co., Philadelphia.
Texas Company, The, 135 East 42nd St., N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Lubricating
Cities Service Oil Co., 60 Wall Tower, N. Y. C.
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Pure Oil Co., The, Chicago.
Shell's Industrial Lubricants Div., Shell Bldg., San Francisco, Shell Bldg., St. Louis, & 50 W. 50th St., N. Y. C.
Standard Oil Co. (Indiana), Chicago.
Texas Company, The, 135 East 42nd St. N. Y. C.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

OILS—Soluble—See Oils—Cutting

ORE BRIDGES
Dravo Corp., Engineering Wks. Div., Pittsburgh.

ORES—Iron
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.

ORES—Manganese
Cuban-American Manganese Corp., 122 East 42nd St., N. Y. C.

OVENS—Coke and By-Product Recovery
Koppers Co., Engineering & Construction Div., Pittsburgh.

OVENS—Core and Mold
Holcroft & Co., Detroit.
Mahon, R. C., Co., Detroit, Mich.

OVENS—Enameling and Japanning
Carborundum Co., The, Perth Amboy, N. J.
Mahon, R. C., Co., Detroit, Mich.

OXY-ACETYLENE — Shape-Cutting Machines
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

OXYGEN
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

PACKING—Felt
American Felt Co., 315 Fourth Ave., N. Y. C.

PACKING—Leather
Chicago (Ill.) Rawhide Mfg. Co., The, 1306 Elston Ave.
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Locomotive Cylinder
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PACKING—Metallic
Garlock Packing Co., The, Palmyra, N. Y.

PACKING—Rubber
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

PACKING—Sheet, Asbestos or Rubber
Carey, Philip, Co., The, Cincinnati, Ohio.
Garlock Packing Co., The, Palmyra, N. Y.
Hewitt Rubber Corp., Buffalo, N. Y.
Johns-Manville Corp., 22 East 40th St., New York City.

PAINT
American Asphalt Paint Co., Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
National Lead Co., 111 Bdway., N. Y. C.

PARALLELS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

PATENT LEVELERS
Voss, Edward W., Pittsburgh, Pa.

PATTERN WORK—Wood
York (Pa.) Pattern Works

PERFORATED METAL
Chicago Perforating Co., 2440 W 24th Place, Chicago, Ill.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.

PICKLING MACHINES
Mesta Mch. Co., Pittsburgh.

PICKLING TANK LININGS
Cellcote Co., The, Cleveland, Ohio.
National Lead Co., 111 Bdway., N. Y. C

PICKLING TANK STEAM JETS
Durion Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PIG IRON
Bethlehem (Pa.) Steel Company.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson (Ohio) Iron & Steel Co., The.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Wisconsin Steel Co., Chicago, Ill.

PIG IRON CASTING PLANTS
Heyl & Patterson, Inc., Pittsburgh.

PILING—Steel Pipe
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PILING—Steel Sheet
American Rolling Mill Co., Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

PILLOW BLOCKS
Medart Co., The, St. Louis, Mo.

PINIONS
Waltham (Mass.) Watch Co.

PINIONS—Rolling Mill
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Mesta Mch. Co., Pittsburgh.

PINIONS—Wire and Rod
Rathbone, A. R. & J., Palmer, Mass.

PINS—Cotter
Lamson & Sessions Co., The, Cleveland.

PIPE—Alloy
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Lead
National Lead Co., 111 Bdway., N. Y. C.

PIPE—Lead Lined
National Lead Co., 111 Bdway., N. Y. C.

PIPE—New and Second-Hand
Albert & Davidson Pipe Corp., 2nd Ave., 50-51st St., Bklyn., N. Y.
Greenpoint Iron & Pipe Co., Inc., 340 Stagg St., Bklyn., N. Y.

PIPE—Seamless Brass or Copper
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

PIPE—Seamless Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

PIPE—Spiral Welded
American Rolling Mill Co., Middletown, O.
Crane Co., Chicago.

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DREIS & KRUMP MFG. CO.
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Products Index

PIPE—Standard, Black and Galvanized
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.
Wheeling (W. Va.) Steel Corp.

PIPE—Welded, Electric
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.

PIPE COVERING—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

PIPE FITTINGS
Crane Co., Chicago.
Jarecki Mfg. Co., Erie, Pa.

PIPE THREADING & CUTTING MACHINES
Cox & Sons Co., The, Bridgeton, N. J.
Jarecki Mfg. Co., Erie, Pa.
Landis, Mach. Co., Inc., Waynesboro, Pa.
Merrell Mfg. Co., Toledo.
Murchey Machine & Tool Co., Detroit, Mich.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

PISTON RINGS
Koppers Co., American Hammered Piston Ring Div., Baltimore, Md.

PLANERS
Cincinnati (Ohio) Planer Co.
Ohio Machine Tool Co., Kenton, Ohio.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

PLANERS—Plate
Cleveland (Ohio) Punch & Shear Works Co., The.
Sellers, William, & Co., Inc., 1620 Hamilton St., Philadelphia, Pa.

PLANERS—Rotary
Cleveland (Ohio) Punch & Shear Works Co., The.
Espen-Lucas Mch. Wks., Philadelphia.

PLANING MACHINES — Second Hand. (See Clearing House Section)

PLASTICS—Moulded
Continental-Diamond Fibre Co., Newark, Delaware.

PLATER'S CLEANING COMPOUND
American Chemical Paint Co., Ambler, Pa.

PLATES—Floor or Cellar Door
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.

PLATES—Iron or Steel
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Ryerson, Joseph T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown (Ohio) Sheet & Tube Co., The.

PLATFORMS—Skid
Standard Pressed Steel Co., Jenkintown Pa.

PLATING—Chromium
United Chromium Incorporated, 51 East 42nd St., N. Y. C.

PLUGS—Core Hole
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.

POLISHING MACHINES—Bar
Medart Co., The, St. Louis, Mo.

POWER TRANSMITTING MACHINERY
Dodge Mfg. Corp., Mishawaka, Ind.

POWER UNITS—Rotary
Cushman Chuck Co., Hartford, Conn.
New Departure Div., General Motors Sales Corp., Bristol, Conn.

POWER UNITS—Straight Line
Cushman Chuck Co., Hartford, Conn.

PRECIPITATORS—Electrostatic Dust
Pangborn Corporation, Hagerstown, Md.

PRESS BRAKES — See Brakes — Metal Forming

PRESS FEEDS—Automatic
Cleveland (Ohio) Punch & Shear Works Co., The.
Littell, F. J., Mch. Co., Chicago.

PRESSED METAL PARTS
Budd, Edward G., Mfg. Co., Phila., Pa.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Davis Brake Beam Co., Laurel Ave. & A St., Johnstown, Pa.
New England Pressed Steel Co., Natick, Mass.
Stanley Works, The, New Britain, Conn.; Bridgeport, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.

PRESSED STEEL PARTS
Budd, Edward G., Mfg. Co., Phila., Pa.
Crosby Co., The, Buffalo, N. Y.
Lansing (Mich.) Stamping Co., So. Penn Ave.
Parish Pressed Steel Co., Reading, Pa.
Stanley Works, The, New Britain, Conn.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

PRESSES—Automatic
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PRESSES—Baling
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
McKay Machine Co., The, Youngstown, Ohio.

PRESSES—Broaching
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Coining
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Die Sinking
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Drawing
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Drop—See Hammers—Drop

PRESSES—Embossing
Farquhar, A. B., Co., Ltd., York, Pa.

PRESSES—Extrusion
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cleveland (Ohio) Punch & Shear Works Co., The.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Foot
Baird Mch. Co., The, Bridgeport, Conn.
Niagara Machine & Tool Works, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

PRESSES—Forging
Ajax Mfg. Co., The, Cleveland, Ohio.
Chambersburg (Pa.) Engineering Co.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Forming and Bending
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Dreis & Krump Mfg. Co., Chicago.
Farquhar, A. B., Co., Ltd., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PRESSES—Friction Screw
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Chambersburg (Pa.) Engineering Co.
Farquhar, A. B., Co., Ltd., York, Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hannifin Mfg. Co., Chicago, Ill.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Metal Extrusion
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Plastics Molding
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PRESSES—Power
Baird Mch. Co., The, Bridgeport, Conn.
Cincinnati (Ohio) Shaper Co., The.
Cleveland Crane & Engineering Co., The Steelweld Machry. Div., Wickliffe, Ohio.
Cleveland (Ohio) Punch & Shear Works Co., The.
Farrel-Birmingham Co., Inc., Ansonia Conn.
Ferracute Machine Co., Bridgeton, New Jersey.
Hyman, Joseph, & Sons, Phila.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
V & O Press Co., Hudson, N. Y.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES—Stamping
Cleveland (Ohio) Punch & Shear Works Co., The.
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Straightening
Farquhar, A. B., Co., Ltd., York, Pa.
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PRESSES—Trimming
Chambersburg (Pa.) Engineering Co.
Cleveland (Ohio) Punch & Shear Works Co., The.
Erie (Pa.) Foundry Co.
Niagara Mch. & Tool Wks., Buffalo, N. Y.

PROJECTORS—Contour Measuring
Jones & Lamson Machine Co., Springfield, Vt.

PULLEYS—Cast Iron, For V-Belts
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.

PULLEYS—Friction Clutch
Dodge Mfg. Corp., Mishawaka, Ind.

PULLEYS—Magnetic
Cutler-Hammer, Inc., Milwaukee.
Stearns Magnetic Mfg. Co., 637 So. 28th St., Milwaukee.

PULLEYS—Solid & Split
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Dodge Mfg. Corp., Mishawaka, Ind.
Falls Clutch & Mchry. Co., The, Cuyahoga Falls, Ohio.

PULVERIZERS
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.
Babcock & Wilcox Co., The, 85 Liberty St., New York City.
Whiting Corp., Harvey, Ill.

PUMPS—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

PUMPS—Centrifugal
Tomkins-Johnson Co., The, Jackson, Mich.

PUMPS—Coolant
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Electric
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Hydraulic
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Roper, Geo. D., Corp., Rockford, Ill.
Watson-Stillman Co., The, 103 Aldene Road, Roselle, N. J.

PUMPS—Hydraulic—Radial—Variable Reversible Delivery
Hydraulic Press Mfg. Co., The, Mt. Gilead, Ohio.

PUMPS—Power
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Power Transmission
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.
Roper, Geo. D., Corp., Rockford, Ill.

PUMPS—Rotary Positive, Centrifugal & Turbine
Crane Co., Chicago.
Roots-Connersville Blower Corp., Connersville, Ind.
Roper, Geo. D., Corp., Rockford, Ill.
Kane & Roach, Inc., Syracuse, N. Y.

PUNCHES & DIES
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

PUNCHING AND SHEARING MACHINES
Bertsch & Co., Cambridge City, Ind.
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Excelsior Tool & Mach. Co., E. St. Louis, Ill.
Niagara Machine & Tools Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

PYROMETERS—Indicating
Hoskins Mfg. Co., Detroit, Mich.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

RACKS—Gear & Pinion
Frick Co., Inc., Waynesboro, Pa.

RAILS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Foster, L. B., Co., Inc., Pittsburgh.
Frank, M. K., 480 Lexington Ave., N. Y. C.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.

RAILS—Relaying
Frank, M. K., 480 Lexington Ave., N. Y. C.
Hyman-Michaels Co., Chicago.
Iron & Steel Products, Inc., Chicago.
Sherwood, E. C., 50 Church St., N. Y. C.

RAILWAY EQUIPMENT & SUPPLIES
Iron & Steel Products, Inc., Chicago.
Pettibone Mulliken Corp., Chicago.

REAMERS
Carboloy Co., Inc., 11153 East 8-Mile Road, Detroit, Michigan.
Cleveland (Ohio) Twist Drill Co., The.
Gisholt Machine Co., Madison, Wisconsin.
Greenfield (Mass.) Tap & Die Corp.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

REAMING MACHINES
Blanchard Machine Co., Cambridge, Mass.

REAMERS—Expansion
Apex Machine & Tool Co., The, Dayton, Ohio.
Barber-Colman Co., Rockford, Ill.
Gairing Tool Co., The, Detroit.
Greenfield (Mass.) Tap & Die Corp.

REELS—For Coil Stock
Littell, F. J., Mch. Co., Chicago.

REFRACTORIES
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Carborundum Co., The, Perth Amboy, N. J.
Illinois Clay Products Co., Joliet, Ill.
Norton Co., Worcester, Mass.

REGULATORS—Compressed Gas
Air Reduction, 60 East 42nd St., N. Y. C.
Linde Aire Products Company, The, 30 East 42nd St., N. Y. C.

REINFORCEMENT FABRIC—Concrete
Pittsburgh (Pa.) Steel Co.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

RIDDLES—Foundry
Ludlow-Saylor Wire Co., St. Louis, Mo.

RINGS—Iron or Steel
Midvale Co., The, Nicetown, Phila., Pa.
Standard Steel Wks. Co., Phila., Pa.

RINGS—Welded
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

RIVET MAKING MACHINERY
Acme Machinery Co., The, Cleveland.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

RIVET SETS
Cleveland (Ohio) Punch & Shear Works Co., The.
Cleveland Steel Tool Co., The, 660 E. 82d St., Cleveland, Ohio.

RIVETING MACHINES
Hannifin Mfg. Co., Chicago, Ill.
Shuster, F. B., Co., The, New Haven, Ct.
Tomkins-Johnson Co., The, Jackson, Mich.

RIVETS
American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Millidale, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

ROCK BITS
Timken Roller Bearing Co., Canton, Ohio.

RODS—Aluminum
Aluminum Co. of America, Pittsburgh.

RODS—Brass
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

RODS—Drill
Kidd Drawn Steel Co., Aliquippa, Pa.

RODS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave. Midland, Mich.

RODS—Nickel Silver
American Brass Co., The, Waterbury, Conn.

RODS—Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

RODS—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Welding
Air Reduction, 60 East 42nd St., N. Y. C.
American Brass Co., The, Waterbury, Conn.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.

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Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

RODS—Welding, Hard Surfacing
Wall-Colmonoy Corp., Detroit, Mich.

RODS—Wire
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.
Youngstown (Ohio) Sheet & Tube Co., The.

ROLLER LEVELERS—Backed Up
McKay Machine Co., The, Youngstown, Ohio.
Voss, Edward W., Pittsburgh, Pa.

ROLLING MACHINERY—Cold Rolling
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLING MACHINERY—Sheet Metal
Continental Roll & Steel Foundry Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.

ROLLING MILL MACHINERY
Continental Roll & Steel Fdry. Co., East Chicago, Ill.
Farrel-Birmingham Co., Inc., Ansonia, Ct.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
McKay Machine Co., The, Youngstown, Ohio.
Mesta Mch. Co., Pittsburgh.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., Avonmore, Pa.
United Engineering & Fdry. Co., Ptgh.
Voss, Edward W., Pittsburgh, Pa.
Waterbury (Ct.) Farrel Fdry. & Mch. Co., The.

ROLLS—Alloy Steel
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
McKay Machine Co., The, Youngstown, Ohio.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.

ROLLS—Bending and Straightening
Baldwin-Southwark Div. Baldwin Locomotive Wks., Philadelphia.
Bertsch & Co., Cambridge City, Ind.
Cleveland (Ohio) Punch & Shear Works Co., The.
Kane & Roach, Inc., Syracuse, N. Y.
McKay Machine Co., The, Youngstown, Ohio.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

ROLLS—Forging
Ajax Mfg. Co., The, Cleveland.

ROLLS—Rubber Covered
Castle Rubber Co., East Butler, Pa.
Hewitt Rubber Corp., Buffalo, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 32 Townsend St., Passaic, N. J.

ROLLS—Sand Chilled Iron and Steel
Continental Roll & Steel Fdry. Co., East Chicago, Ind.
Lewis Foundry & Machine Div. of Blaw-Knox Co., Pittsburgh.
Mackintosh-Hemphill Co., Pittsburgh
Mesta Mch. Co., Pittsburgh.
National Roll & Fdry. Co., Avonmore, Pa.
Ohio Steel Foundry Co., Lima, Ohio.
Pittsburgh Rolls Div. of Blaw-Knox Co., Pittsburgh.
United Engineering & Fdry. Co., Ptgh.

ROLLS—Special Hardened
Bethlehem (Pa.) Steel Company.
Midvale Co., The Nicetown, Phila., Pa.

ROOFING MATERIALS
Carey, Philip, Co., The, Cincinnati, Ohio.

ROOFING—Coal Tar Pitch
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

ROOFING—Special Copper Bearing Steel
Superior Sheet Steel Co., Canton, Ohio.

ROOFING—Steel Deck
Mahon, R. C., Co., Detroit, Mich.

ROOFING AND SIDING—Corrugated and Plain
American Rolling Mill Co., Middletown, O.
Carey, Philip, Co., The, Cincinnati, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Johns-Manville Corp., 22 East 40th St., New York City.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

ROOFING AND SIDING—Iron and Steel
Inland Steel Co., Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

ROOFING & SIDING—(Zinc)—Corrugated & Plain
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ROTARY MILLING MACHINES
National Broach & Machine Co., Detroit, Mich.

ROTARY SHAVING MACHINES
National Broach & Machine Co., Detroit, Mich.

RUBBER MOLDED PARTS
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING COMPOUNDS
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

RUST PROOFING MACHINES
Mahon, R. C., Co., Detroit, Mich.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Enterprise Galvanizing Co., Philadelphia.
Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.
Southern Galvanizing Co., Baltimore, Md.

SALT CANDY
Hardie Brothers Co., Pittsburgh, Pa.

SALT TABLETS
Morton Salt Co., Chicago, Ill.

SAND BLAST EQUIPMENT & MACHINES
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST STEEL SHOT
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Harrison Abrasive Corp., Manchester, N. H.
Pangborn Corporation, Hagerstown, Md.
Pittsburgh (Pa.) Crushed Steel Co.

SAND HANDLING EQUIPMENT
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

SAWING MACHINES—Metal
Espen-Lucas Mch. Works, Phila.

SAWING MACHINES—Metal—Band
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

SAWS—Band and Hack for Metal
Armstrong-Blum Mfg. Co., Chicago.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Circular, Rip & Cutoff
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis Ind.

SAWS—Friction
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia

SAWS—Hack Saw Blades
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Millers Falls Co., Greenfield, Mass.

SAWS—Hot Metal
Ajax Mfg. Co., The, Cleveland.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Inserted Tooth, Cold
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Tabor Mfg. Co., Philadelphia.

SAWS—Milling
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.

SAWS—Screw Slotting
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Barber-Colman Co., Rockford, Ill.
Greenfield (Mass.) Tap & Die Corp.

SCALES
Streeter-Amet Co., Chicago.
Toledo (Ohio) Scale Co.

SCRAP BUNDLERS—See Presses—Baling

SCREENS—Perforated Metal
Chicago Perforating Co., 2440 W. 24th Place, Chicago, Ill.
Diamond Mfg. Co., Wyoming, Pa.
Erdle Perforating Co., Rochester, N. Y.
Harrington & King Perforating Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Mundt, Chas., & Sons, 59 Fairmount Ave., Jersey City, N. J.

SCREENS—Woven Wire
Ludlow-Saylor Wire Co., St. Louis, Mo.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

SCREW DRIVER BITS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW DRIVERS—Recessed Head Type
Apex Machine & Tool Co., The, Dayton, Ohio.

SCREW MACHINE PRODUCTS
Blake & Johnson Co., The, Waterville, Conn.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Commonwealth Brass Corp., Detroit.
Defiance Screw Machine Prods Div. of The Serrick Corp., Defiance, Ohio.

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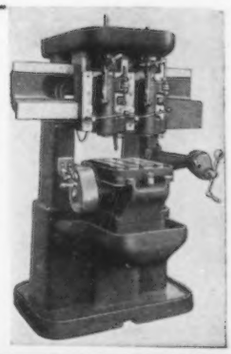

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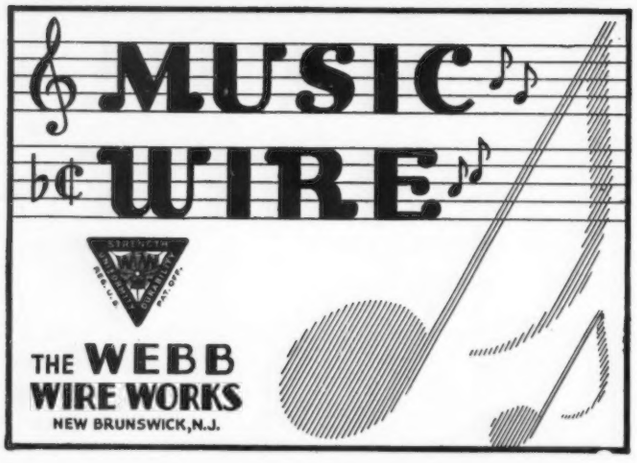

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Eastern Mch. Screw Corp., New Haven, Ct.
Mid-West Screw Products Co., 20 St. George St., St. Louis, Mo.
Miles, Franklin S., 2422-28 N. Masher St., Phila., Pa.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.
Olson Mfg. Co., Worcester, Mass.
Ottemiller, Wm. H., Co., Inc., York, Pa.
Peck Spring Co., The, Plainville, Conn.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Waltham (Mass.) Watch Co.

SCREW MACHINERY—Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SCREW MACHINERY—Hand
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., The, Cleveland.

SCREW MACHINERY—Multiple Spindle
Acme Machine Tool Co., The, Cincinnati, Ohio.
Cone Automatic Machine Co., Inc., Windsor, Vt.
National Acme Co., The, Cleveland.

SCREW PLATES
Greenfield (Mass.) Tap & Die Corp.

SCREW STOCK
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SCREWS—Cap
Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Mid-West Screw Products Co., 20 St. George St., St. Louis, Mo.
National Acme Co., The, Cleveland
Ottemiller, Wm. H., Co., Inc., York, Pa.
Triplex Screw Co., Cleveland.

SCREWS—Coach or Lag
Lamson & Sessions Co., The, Cleveland.

SCREWS—For Sheet Metal
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS—Hardened Metallic Drive
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS—Locking
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.

SCREWS—Machine
Blake & Johnson Co., The, Waterville, Conn.
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., The, Torrington, Ct.
Shimer, Samuel J., & Sons, Inc., Milton, Pa.
Triplex Screw Co., Cleveland.

SCREWS—Machine, Recessed Head
American Screw Co., Providence, R. I.

SCREWS—Safety Set
Parker-Kalon Corp., 200 Varick St., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Set
Cleveland (Ohio) Cap Screw Co., The.
National Acme Co., The, Cleveland.
Ottemiller, Wm. H., Co., Inc., York, Pa.

SCREWS—Sheet Metal Recessed Head
American Screw Co., Providence, R. I.

SCREWS, Socket Head Cap
Parker-Kalon Corp., 200 Varick St., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS—Wood, Recessed Head
American Screw Co., Providence, R. I.

SCREWS—Thread Cutting
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.

SCRIBERS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SCRUBBING MACHINES—Sheet
Wean Engineering Co., Inc., The, Warren, Ohio.

SCYTHE STONES AND WHETSTONES
Carborundum Co., The, Niagara Falls, N.Y.

SECOND - HAND MACHINERY—(See Clearing House Section)

SEPARATORS—Magnetic
Dings Magnetic Separator Co., 727 Smith St., Milwaukee.
Ohio Electric Mfg. Co., The, 5908 Maurice Ave., Cleveland.
Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

SHAFTING—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wisconsin Steel Co., Chicago, Ill.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAFTING—Steel
American Steel Export Co., 347 Madison Ave., New York City.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

SHAFTING—Turned and Ground
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wisconsin Steel Co., Chicago, Ill.
Wyckoff Drawn Steel Co., Pittsburgh.

SHAPERS
Cincinnati (Ohio) Shaper Co., The.
Ohio Machine Tool Co., Kenton, Ohio.

SHAPERS—Vertical
Pratt & Whitney Div. Niles-Bement-Pond Co., West Hartford, Conn.

SHAPES—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

SHEAR BLADES & KNIVES
American Shear Knife Co., Homestead, Pa.
Atkins, E. C., & Co., 406 So. Illinois St., Indianapolis, Ind.
Canton Fdry. & Mch. Co., Cleveland.
Cleveland (Ohio) Punch & Shear Works Co., The.
Heppenstall Co., Pittsburgh, Pa.

SHEARING MACHINES—Alligator
Canton Fdry. & Mch. Co., Cleveland.

SHEARING MACHINES—Angle, Hand and Power
Cleveland (Ohio) Punch & Shear Works Co., The.
Federal Bearings Co., Inc., The, Poughkeepsie, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y

SHEARING MACHINES—Bar
Buffalo (N. Y.) Forge Co., 492 Broadway.
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.
United Engineering & Fdry. Co., Ptgh.

SHEARING MACHINES — Beam and Channel
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Ptgh.

SHEARING MACHINES—Billet
Morgan Engineering Co., The, Alliance, O.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Ptgh.

SHEARING MACHINES — Continuous Sheet & Pack
Cleveland (Ohio) Punch & Shear Works Co., The.

SHEARING MACHINES—Plate
Bertsch & Co., Cambridge City, Ind.
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Mesta Mch. Co., Pittsburgh.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, Buffalo, N. Y.
Schatz Mfg. Co., The, Poughkeepsie, N. Y
United Engineering & Fdry. Co., Ptgh.

SHEARING MACHINES — Sheet and Plate
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Squaring
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARING MACHINES—Up Cut
McKay Machine Co., The, Youngstown, Ohio.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.

SHEET LIFTERS
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.

SHEET METAL MACHINERY
Cincinnati (Ohio) Shaper Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.
Dreis & Krump Mfg. Co., Chicago.
Ferracute Machine Co., Bridgeton, New Jersey.
Kane & Roach, Inc., Syracuse, N. Y.
New Albany (Ind.) Mch. Mfg. Co.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
V & O Press Co., Hudson, N. Y.
Voss, Edward W., Pittsburgh, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

SHEETS—Aluminum
Aluminum Co. of America, Pittsburgh.

SHEETS—Auto Body
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.

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Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Inland Steel Co., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Black
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.

SHEETS—Blue Annealed
Alan Wood Steel Co., Conshohocken, Pa.
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Ryerson, Jos. T., & Son, Inc., Chicago.
Worth Steel Co., Claymont, Del.

SHEETS—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

SHEETS—Chrome
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Chrome Nickel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SHEETS—Chromium Plated
American Nickeloid Co., 1312 Second St., Peru, Ill.

SHEETS—Coated
American Nickeloid Co., 1312 Second St., Peru, Ill.

SHEETS—Cold Rolled
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Ecorse, Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos., T., & Son, Inc., Chicago.
Weirton (W. Va.) Steel Co.

SHEETS—Copper Alloy
American Brass Co., The, Waterbury, Conn.

SHEETS—Copper Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Wheeling (W. Va.) Steel Corp.

SHEETS—Electrical
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Enameling
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Granite City (Ill.) Steel Co.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

SHEETS—For Drawing and Stamping
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., Canton, Ohio.
Worth Steel Co., Claymont, Del.

SHEETS—Full Finished
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Galvanized, Flat and Corrugated
American Rolling Mill Co., Middletown, O.
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Granite City (Ill.) Steel Co.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Superior Sheet Steel Co., The, Canton, Ohio.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Weirton (W. Va.) Steel Co.
Youngstown (Ohio) Sheet & Tube Co., The.

SHEETS—Galvannealed
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Hot Rolled
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Hot Rolled Pickled
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Lead
National Lead Co., 111 Bdway., N. Y. C.

SHEETS—Long Terne
American Rolling Mill Co., Middletown, Ohio.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.
Superior Sheet Steel Co., The, Canton, Ohio.

SHEETS—Magnesium Alloys
American Magnesium Corp., 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

SHEETS—Metal Furniture
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Republic Steel Corp., Cleveland, Ohio.

SHEETS—Tin Mill Black
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Granite City (Ill.) Steel Co.
Newport (Ky.) Rolling Mill Co., The, Div. of The Andrews Steel Co.

SHEETS—Zinc
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

SHOP FURNITURE
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

SHOVELS—Gasoline
Marion (Ohio) Steam Shovel Co.

SHOVELS—Steam
Marion (Ohio) Steam Shovel Co.

SHOVELS—Mounted—See Cranes

SHUTTERS—Steel & Wood Bi-Folding
Kinnear Mfg. Co., Columbus, Ohio.

SILICO—MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SILICON METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

SINE BARS
Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

SLABS
Andrews Steel Co., The, Newport, Ky.

SLINGS—Wire Rope
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.

SLITTERS—Gang
McKay Machine Co., The, Youngstown, Ohio.

SLOTTERS
Lobdell Car Wheel Co., Nazel Hammer Div., Wilmington, Del.

SOLDER—All Kinds
Kester Solder Co., Chicago, Ill.

SOLDER—Flux-Filled
Kester Solder Co., Chicago, Ill.

SOLVENTS—Oil & Grease
Detroit Rex Products Co., Detroit, Mich.

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Bullard Co., The, Bridgeport, Conn.
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Morgan Engineering Co., The, Alliance, O.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Ohio Machine Tool Co., Kenton, Ohio.
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Torrington (Conn.) Mfg. Co., The.
Weatherly (Pa.) Foundry & Mfg. Co.
Whiting Corp., Harvey, Ill.

SPEED REDUCERS
James, D. O., Mfg. Co., Chicago, Ill.
Link-Belt Co., 2045 West Hunting Park Ave., Phila., Pa.
Poole Foundry & Mch. Co., Baltimore, Md.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
New Jersey Zinc Co., The, 160 Front St., New York City.

SPIKES—Track
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.

SPINDLES—Boring
Cimatool Co., The, Dayton, Ohio.

SPINDLES—Grinding
Ex-Cell-O Corp., 1210 Oakman Blvd., Detroit, Mich.

SPINNINGS—Aluminum
American Aluminum Ware Co., 372 Jelliff Ave., Newark, N. J.

SPLICE BARS
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

SPRAY BOOTHS—Paint
Mahon, R. C., Co., Detroit, Mich.

SPRING MAKING MACHINERY
Baird Mch. Co., The, Bridgeport, Conn.

SPRINGS—Car
Miller & Van Winkle, Inc., Sherman & Crosby Aves., Paterson, N. J.

SPRINGS—Extension, Compression, Torsion or Flat
Amer. Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Cook Plant of Barnes-Gibson-Raymond Div. of Associated Spring Corp., Ann Arbor, Mich.
Cuyahoga Spring Co., The, Cleveland.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., Sherman & Crosby Aves., Paterson, N. J.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

SPROCKETS
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Morse Chain Co., Ithaca, N. Y.
Whitney Chain & Mfg. Co., Hartford, Ct.

STAMPINGS & DRAWINGS—Aluminum
American Aluminum Ware Co., 372 Jelliff Ave., Newark, N. J.

STAMPINGS OR DRAWINGS—Metal
Adell Corp., Orange, Mass.
American Pulley Co., Pressed Steel Stamping Div., Philadelphia.
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Budd, Edward G., Mfg. Co., Phila., Pa.
Champion Sheet Metal Co., Inc., cor. Squires & Duane Sts., Cortland, N. Y.
Chase Brass & Copper Co., Inc., 40 Roland St., Waterbury, Conn.
Cook Plant of Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Ann Arbor, Mich.
Crosby Co., The, Buffalo, N. Y.
Dunbar Bros. Co., Div. of Associated Spring Corp., Bristol, Conn.
Eastern Tool & Stpg. Co., Inc., Saugus, Mass.
Flynn, Michael, Mfg. Co., Phila., Pa.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Lansing (Mich.) Stamping Co., So. Penn. Ave.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Miller & Van Winkle, Inc., Sherman & Crosby Aves., Paterson, N. J.
New England Pressed Steel Co., Natick, Mass.
Parish Pressed Steel Co., Reading, Pa.
Raymond Mfg. Co., Div. of Associated Spring Corp., Corry, Pa.
Sessions, J. H., & Son, Hooker Court, Bristol, Conn.
Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
Southern Products, Independence, Mo.
Stanley Works, The, New Britain, Conn.
Torrington (Conn.) Company
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Wagner Specialty Co., Burlington, Wisc.
Whitehead Stamping Co., 1669 W. Lafayette Blvd., Detroit, Mich.
Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

STAMPS—Steel Alphabets and Figures
Cunningham, M. E., Co., Pittsburgh, Pa.

STAPLES—Wire
Wickwire Brothers, Cortland, N. Y.

STEEL—Acid Resisting
Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

STEEL—Alloy
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel Export Co., 347 Madison Ave., New York City.
Andrews Steel Co., The, Newport, Ky.
Bethlehem (Pa.) Steel Company.
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Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Youngstown (Ohio) Sheet & Tube Co. The.

STEEL—Alloy, Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div., Republic Steel Corp., Massillon, Ohio.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Bright Finished
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

STEEL—Carbon
American Steel Export Co., 347 Madison Ave., New York City.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.

STEEL—Case Hardening
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Monarch Steel Co., Indianapolis, Ind.

STEEL—Chrome Molybdenum
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Chrome Nickel
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Chrome Nickel Silver
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.

STEEL—Cobalt
Darwin & Milner, Inc., Cleveland.

STEEL—Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
Kidd Drawn Steel Co., Aliquippa, Pa.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Rathbone, A. B. & J., Palmer, Mass.
Ryerson, Joseph T., & Son, Inc., Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Cold Rolled Strip
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Griffin Mfg. Co., Erie, Pa.
Jones & Laughlin Steel Corp., Pittsburgh.
Republic Steel Corp., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., Chicago.
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Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.
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Worcester (Mass.) Pressed Steel Co., 104 Barber Ave.

STEEL—Cold Rolled Strip—Electro Brass Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Copper Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro-Galvanized Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Tin Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Electro Zinc Coated
Thomas Steel Co., The, Warren, Ohio.

STEEL—Cold Rolled Strip, Stainless
Griffin Mfg. Co., Erie, Pa.

STEEL—Corrosion Resisting
Midvale Co., The, Nicetown, Phila., Pa.
Rustless Iron & Steel Corp., Baltimore, Md.
Superior Steel Corp., Carnegie, Pa.

STEEL—Crucible
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Jessop, Wm., & Son, Inc., 627-629 Sixth Ave., N. Y. C.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Cutlery
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL—Die
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Jessop, Wm., & Sons, Inc., 627-29 Sixth Ave., N. Y. C.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL—Drill
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.

STEEL—Electric
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—High Speed
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland (Ohio) Twist Drill Co., The.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Latrobe (Pa.) Electric Steel Co.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL—Hot Rolled Strip
Bethlehem (Pa.) Steel Company.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Great Lakes Steel Corp., Ecorse, Detroit.
Inland Steel Co., Chicago.
Jones & Laughlin Steel Corp., Pittsburgh.
Laclede Steel Co., St. Louis, Mo.
Republic Steel Corp., Cleveland, Ohio.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Stanley Works, The, New Britain, Conn., Bridgeport, Conn.
Steel & Tubes Div. of Republic Steel Corp., Cleveland.
Superior Steel Corp., Carnegie, Pa.

STEEL—Open Hearth
Andrews Steel Co., The, Newport, Ky.
Pittsburgh (Pa.) Steel Co.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Rustless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Griffin Mfg. Co., Erie, Pa.
Rustless Iron & Steel Corp., Baltimore, Md.

STEEL—Screw
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh.
LaSalle Steel Co., Chicago.
Monarch Steel Co., Indianapolis, Ind.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wyckoff Drawn Steel Co., Pittsburgh.

STEEL—Special Analysis
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Andrews Steel Co., The, Newport, Ky.
Bliss & Laughlin, Inc., Harvey, Ill.; Buffalo, N. Y.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Harrisburg (Pa.) Steel Corp.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.

STEEL—Spring
Barnes-Gibson-Raymond, Detroit Plant, Div. of Associated Spring Corp.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Republic Steel Corp., Cleveland, Ohio.
Timken Roller Bearing Co., The, Canton, O.
Timken Steel & Tube Div., The Timken Roller Bearing Co., Canton, O.
Youngstown (Ohio) Sheet & Tube Co., The.

STEEL-Stainless
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Disston, Henry, & Sons, Inc., Philadelphia.
Latrobe (Pa.) Electric Steel Co.
Republic Steel Corp., Cleveland, Ohio.
Rustless Iron & Steel Corp., Baltimore, Md.
Ryerson, Jos. T., & Son, Inc., Chicago.
Scully Steel Products Co. (U. S. Steel Corp. Subsidiary), Chicago.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.
Wetherell Bros. Co., Cambridge, 39, Mass.

STEEL—Stainless Clad
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.

STEEL—Tool
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem (Pa.) Steel Company.
Crucible Steel Co. of America, Chrysler Bldg., N. Y. C.
Darwin & Milner, Inc., Cleveland.
Disston, Henry, & Sons, Inc., Philadelphia.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div. Borg-Warner Corp., Chicago.
Jessop, Wm., & Sons, Inc., 627-629 Sixth Ave., N. Y. C.
Kidd Drawn Steel Co., Alquippa, Pa.
Midvale Co., The, Nicetown, Phila., Pa.
Ryerson, Jos. T., & Son, Inc., Chicago.
Tennessee Coal, Iron & Railroad Co. (U. S. Steel Corp. Subsidiary), Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

STEEL MILL EQUIPMENT
Wellman Engineering Co., The, Cleveland

STEEL PLANTS AND ROLLING MILLS
Brassert, H. A., & Co., Chicago, Ill.

STEEL ROLLS
Continental Roll & Steel Foundry Co., East Chicago, Ind.
United Engineering & Fdry. Co., Pitgh.

STOKERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.
Whiting Corp., Harvey, Ill.

STOPPERS—Neoprene
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

STOPPERS—Rubber
Rhoades, R. W., Metaline Co., Inc., Long Island City, N. Y.

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Ford Motor Co. (C. E. Johansson Div.), Dearborn, Mich.

STRAIGHTENING AND DRAWING MACHINES—For Bars
Ajax Mfg. Co., The, Cleveland.

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Kane & Roach, Inc., Syracuse, N. Y.
Medart Co., The, St. Louis, Mo.

STRAIGHTENING MACHINES—Wire
Kane & Roach, Inc., Syracuse, N. Y.
Lewis Machine Co., 3455 E. 76th St., Cleveland.
Shuster, F. B., Co., The, New Haven, Conn.

STRUCTURAL IRON AND STEEL WORK
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Bethlehem (Pa.) Steel Company.
Mahon, R. C., Co., Detroit, Mich.
Morgan Engineering Co., The, Alliance, O.

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STUDS
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SUMPS—Roof
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SUPERHEATERS
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SWAGING MACHINES
Torrington (Conn.) Company.

SWITCHES—Electric
Westinghouse Elec. & Mfg. Co., East Pitgh.

TANK LININGS
Cellcote Co., The, Cleveland, Ohio.

TANK LININGS—Rubber
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

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Detroit Rex Products Co., Detroit, Mich.

TANKS—Compressed Air, Gas, Oil and Water
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Haveg Corp., Newark, Delaware.
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Manhattan Rubber Mfg. Div. of Raybestos-Manhattan Inc., The, 2 Townsend St., Passaic, N. J.

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National Acme Co., The, Cleveland.

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TERNE PLATES
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

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TOOL BITS
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Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.

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Gairing Tool Co., The, Detroit.
Gisholt Machine Co., Madison, Wisconsin.
Jones & Lamson Machine Co., Springfield, Vt.
Williams, J. H., & Co., Buffalo, N. Y.

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Gisholt Machine Co., Madison, Wisconsin.
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Michigan Tool Co., Detroit, Mich.
National Broach & Machine Co., Detroit, Mich.
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National Broach & Machine Co., Detroit, Mich.

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TOOLS—Tungsten Carbide
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Weldit Acetylene Co., Detroit, Mich.

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TRAILERS — Industrial — See Trucks, Tractors and Trailers—Industrial

TRAMRAILS—Overhead Systems
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Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

TRAMWAYS—Wire Rope
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Reeves Pulley Co., Columbus, Indiana.

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Nicholson, W. H., & Co., 165 Oregon St., Wilkes-Barre, Pa.

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Hendrick Mfg. Co., Carbondale, Pa.
Norton Co., Worcester, Mass.

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Elwell-Parker Electric Co., The, Cleveland.
Yale & Towne Mfg. Co., The, Phila. Div., Phila., Pa.

TRUCKS—Lift (Hand & Foot)
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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., Ptgh.
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

TUBE MILL MACHINERY—Welded
Continental Roll & Steel Foundry Co., Industrial Equipment Div., East Chicago, Ind.
McKay Machine Co., The, Youngstown, Ohio.

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Jones & Laughlin Steel Corp., Pittsburgh.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
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Steel & Tubes Div. of Republic Steel Corp., Cleveland.
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Littell, F. J., Mch. Co., Chicago.
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Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
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Eaton Mfg. Co., Massillon, Ohio.
Hubbard, M. D., Spring Co., 351 Centre Ave., Pontiac, Mich.
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Shakeproof Lock Washer Co., 2525 N. Keeler Ave., Chicago.
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Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
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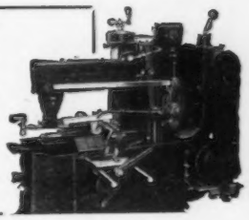

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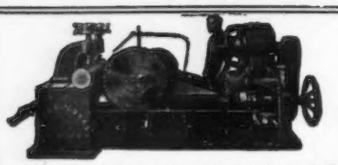

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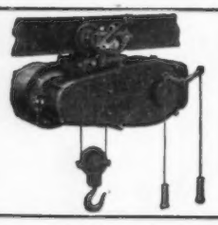

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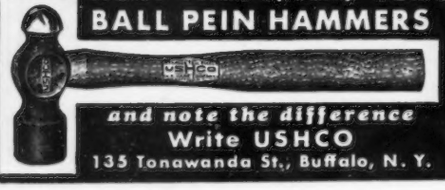

Complete Range of Sizes. Adopted as Standard by Industries needing Better Forged Head and Better Balanced Tool.
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135 Tonawanda St., Buffalo, N. Y.

Products Index

WELDING FIXTURES
Harnischfeger Corp., 4101 W. National Ave., Milwaukee.

WELDING MACHINES—Butt
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Electric Arc
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4101 W. National Ave., Milwaukee, Wis.
Hobart Bros., Troy, Ohio.
Lincoln Electric Co., The, Cleveland.
Westinghouse Elec. & Mfg. Co., East Ptgh.

WELDING MACHINES—Electric Arc, Second-Hand. (See Clearing House Section)

WELDING MACHINES—Flash
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.

WELDING MACHINES—Press
Federal Machine & Welder Co., Warren, Ohio.

WELDING MACHINES—Seam
Federal Machine & Welder Co., Warren, Ohio.

WELDING MACHINES—Spot
Federal Machine & Welder Co., Warren, Ohio.
Swift Electric Welder Co., Detroit.

WHEELS—Rolled Steel
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Standard Steel Wks. Co., Phila., Pa.

WHEELS—Seam Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh.

WIRE—Barb
Pittsburgh (Pa.) Steel Co.

WIRE—Brass, Bronze, Copper, Nickel Silver or Phosphor Bronze
American Brass Co., The, Waterbury, Conn.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.

WIRE—Flat, Round, Square or Special Shapes
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Laclede Steel Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Insulated
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General Electric Co., Schenectady, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

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Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Netting
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.

WIRE—Piano and Music
Webb Wire Works, New Brunswick, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Rustless
Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Special Drawn Shapes
Rathbone, A. B. & J., Palmer, Mass.

WIRE—Spring
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Barnes, Wallace Co., Div. of Associated Spring Corp., Bristol, Conn.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
Roebling, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.

WIRE—Spring (Music)
Webb Wire Works, New Brunswick, N. J.

WIRE—Stainless Steel
Rustless Iron & Steel Corp., Baltimore, Md.
Webb Wire Works, New Brunswick, N. J.

WIRE—Steel
Bethlehem (Pa.) Steel Company.
Wickwire Brothers, Cortland, N. Y.

WIRE—Welding
Air Reduction, 60 East 42nd St., N. Y. C.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Pittsburgh (Pa.) Steel Co.
Revere Copper & Brass, Inc., 230 Park Ave., New York City.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., The, Fostoria, Ohio.
Wickwire Brothers, Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH
Buffalo (N. Y.) Wire Wks. Co., Inc.
Ludlow-Saylor Wire Co., St. Louis, Mo.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE DRAWING MACHINERY—See Wire Mill Mchry. & Equip.

WIRE DRAWING, STRAIGHTENING & CUTTING MACHINERY
Ajax Mfg. Co., The, Cleveland.

WIRE FORMING MACHINERY
Ajax Mfg. Co., The, Cleveland.
Baird Mch. Co., The, Bridgeport, Conn.
Nilson, A. H., Mach. Co., Bridgeport, Ct.

WIRE MILL MACHINERY AND EQUIPMENT
Lewis Machine Co., The, 3455 E. 76th St., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Waterbury (Ct.) Farrel Fdry. & Mach. Co., The.

WIRE PRODUCTS
American Spring & Mfg. Corp., Holly, Mich.
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Buffalo (N. Y.) Wire Wks. Co., Inc.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 351 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Pittsburgh.
Pittsburgh (Pa.) Steel Co.
U. S. Steel Wire Spring Co., Cleveland, O.
Wickwire Bros., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE PRODUCTS—Formed Wire
American Spring & Mfg. Corp., Holly, Mich.
Cuyahoga Spring Co., The, Cleveland.
Eastern Tool & Mfg. Co., Bloomfield, N. J.
Jeschke Wire & Specialty Co., 315 Industrial Ave., Crawfordsville, Ind.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Parker Metal Goods Co., 20 Grafton St., Worcester, Mass.
Roebling's, John A., Sons Co., Trenton, N. J.
Southern Products, Independence, Mo.

WIRE ROPE
American Steel & Wire Co. (U. S. Steel Corp. Subsidiary), Cleveland.
Bethlehem (Pa.) Steel Company.
Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.
Jones & Laughlin Steel Corp., Pittsburgh.
Leschen, A., & Sons Rope Co., St. Louis, Mo.
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., 500 Fifth Ave., N. Y. C.

WIRE ROPE FITTINGS
Macwhyte Co., Kenosha, Wisc.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE STRAIGHTENING AND CUTTING MACHINERY—Automatic
Lewis Machine Co., The, 3455 E. 76th St., Cleveland.
Shuster, F. B., Co., The, New Haven, Ct.

WRENCHES
Armstrong Bros. Tool Co., Chicago.
Williams, J. H., & Co., Buffalo, N. Y.

WRENCHES—Pipe
Greenfield (Mass.) Tap & Die Corp.
Uscho Mfg. Co., Inc., 135 Tonawanda St., Buffalo, N. Y.

ZINC—Rolled
New Jersey Zinc Co., The, 160 Front St., New York City.

ZINC—SLAB (Spelter)
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

ZINC—Strip
New Jersey Zinc Co., The, 160 Front St., New York City.
Platt Bros. & Co., The, Waterbury, Conn.

ZIRCONIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

CONSIDER GOOD USED EQUIPMENT FIRST

IMMEDIATE AVAILABILITY AND DELIVERY ARE IMPORTANT FACTORS

BENDING ROLLS
10′ Kling, Motor Driven. Capacity ½″
20′ Niles, Motor Driven. Capacity ⅝″

BORING MILL—HORIZONTAL
8″ bar Barrett Cylinder Boring Machine. B.M.D.

BRAKE—LEAF TYPE
6′ Dreis & Krump "Chicago" No. 167, Motor Driven. Capacity ⅜″

BRAKES—PRESS TYPE
6′ Dreis & Krump, Motor Driven. Capacity ⅜″
8′6″ Loy & Nawrath, M.D. Capacity ≵10 Gauge
10′ Loy & Nawrath ≵610, Arr. for M.D. Cap. ⅜″
10′6″ Bertsch, M.D. Capacity ≵10 Gauge

CRANES—OVERHEAD ELECTRIC TRAVELING

5 ton Bedford	35′6″	Span. 220/3/60 A.C.
10 ton Northern	49′	Span. 220 Volt D.C.
10 ton Northern	66′9″	Span. 440/3/60 A.C.
10 ton American	59′10″	Span. 220/3/60 A.C.
10 ton Champion	85′11″	Span. 440/3/60 A.C.
20 ton Morgan	50′	Span. 220 Volt D.C. 5 ton Auxiliary
20 ton Morgan	62′	Span. 230 Volt D.C. 10 ton Auxiliary

DRAW BENCHES
10,000≵ Richard. Arranged for Motor Drive. Bed 25′ Long. 18′ Draw
20,000≵ Draw Bench, Belt Driven. 40′ Draw
25,000≵ Draw Bench, Arr. for Belted Mtr. Dr. Bed 35′ Long. Equipped with Aetna Pusher and Hydraulic Equipment for operation
100,000≵ Aetna No. 3. Equipped with Aetna Pusher. Capacity to draw 1″ to 4½″ round bars

FORGING MACHINES
⅜″ to 7″ Ajax, National, Acme, Steel Frame

GEAR REDUCTION UNITS
1500 H.P. Falk Herringbone Gear Drive, 231 RPM to 26 RPM
2500 H.P. General Electric Gear Drive
1500 H.P. Mesta Single Reduction Gear Drive at 30 RPM

HAMMERS — BOARD DROP — STEAM DROP — STEAM FORGING
1000 lb. to 8000 lb. Chambersburg, Billings & Spencer, Erie, Niles-Bement-Pond, Morgan

JOGGLING MACHINE
No. 2 Morgan Plate Joggling Machine. M.D. Capacity to joggle ⅝″ Plate 42″ from edge

LATHE—ROLL
44″ Hyde Park Double Roll Lathe, Motor Driven. 33′ Bed with head stock at each end 22′ between centers

LATHE—WHEEL
90″ Niles Heavy Driving Wheel Lathe. M.D. Two face plates 90″ diameter and 14″ wide, equipped with 4 chuck jaws

LEVELLER—ROLLER
62″ Hilles & Jones Type B, Motor Driven. Capacity 10 Gauge & Lighter

MILLING MACHINES—PLANER TYPE
30″x24″x12′ Ingersoll Horizontal Inclined Rail Type Milling Machine. Motor Driven
48″ Newton Horizontal Adjustable Rail Type Milling Machine. Motor Driven. 59″ Between Housings. Table 42″x12′4″ Between Pockets

PLANERS
72″x60″x31′ Pond Two Head, B.D.
72″x72″x12′ Putnam Three Head, M.D.
100″x84″x25′ Pond Four Head, B.M.D.

PLANERS—OPENSIDE
48″x48″x16′ Detrick & Harvey, Belted M.D. Two Heads on Cross Rail, One Side Head
60″x52″x22′ Liberty, Motor Drive. Two Heads on Cross Rail, One Side Head

PLANER—PLATE EDGE
20′4″ Covington, Belted M.D. Capacity to plane plate 18′ long by 1¼″ thick

3000# CHAMBERSBURG STEAM DROP HAMMER
Guided Ram Type
Steel Base
New in 1929 and Never Used

No. 12-22 VAUGHN MOTOBLOC
30″ DIAMETER BLOCK
Direct Connected Motor Drive
Will Draw Stock Up to 1/16″ Dia.
Or Finished Wire 1″ Dia.

No. 2 HILLES & JONES
PLATE STRAIGHTENING ROLL
Six 10″ Diameter Rolls
Capacity ½″ Plate
Motor Driven, Including A.C. Motor

600 TON BIRDSBORO
HORIZONTAL HYDRAULIC BENDING & FORMING PRESS
24″ Stroke
Face of Ram 24″ High 33″ Wide 26′ Long
Three Main Cylinders 12″ Diameter
Equipped with Pull Back Cylinders
Two 4-Cylinder Vertical
High Pressure Hydraulic Pumps
Direct Driven by two 40 H.P. A.C. Motors

96″ No. 5 CLEVELAND GATE SHEAR
Any Capacity Including ¾″ Plate
36″ Throat
Cam Operated Spring Type Hold Down
Motor Driven

PRESSES—HYDRAULIC
300 ton Chambersburg Self-Contained Four Column Hydro-Pneumatic Press, 12″ dia. of ram, 18″ stroke, 49″ Between Columns
750 ton Mesta Four Column Forging Press 20″ Dia. of ram, 24″ Stroke, 5′ Between Columns
1200 ton Wood Hydraulic Press, 23½″ Dia. Cylinder, 10″ troke. Complete with Accumulator & Pump
3000 ton Wood Four Column Forging Press 36″ dia. of ram, 24″ Stroke, 22″x41″ Between Columns

PRESSES—STRAIGHT SIDE—SINGLE ACTING
No. 3½ Bliss Double Crank, 2″ Stroke, 36″ Between Uprights
No. 7 Bliss Double Crank 5″ Stroke, 45″ Between Uprights
No. 96F Toledo Double Crank, 12″ Stroke, 124″ Between Uprights
No. 2719 Hamilton, 8″ Stroke, 27″ Between Uprights

PRESS—MISCELLANEOUS
300 ton Southwark Hydraulic Shell Piercing Four Column Press. 41″x65″ Between Columns, 48″ Dia. Ram, 48″ Stroke

PUNCH—BEAM
Kling Beam Punch & Coping Machine, Arr. for Motor Drive. Capacity to cope or notch 6″ to 24″ I-beams. Equipped to punch six ¾″ holes in ½″ plate; shear 8″ channels or I-beams

PUNCH—MULTIPLE
Hilles & Jones No. 7, 38″ Between Housing, 18″ Throat. Motor Driven. Capacity to punch 40 13/16″ holes thru ⅝″ plate. Equipped with Thomas Spacing Table 22′6″ long

ROLLS—PLATE STRAIGHTENING
50″ Cleveland Motor Driven. Eight 10″ diameter rolls. Capacity ½″ Plate
60″ Hilles & Jones ≵3, Motor Drive. Six 12″ Dia. Rolls. Capacity 1″ Plate

ROLL—TAPER FORGING
No. 1 Ajax, Belt Driven. With Shear Attachment

ROLLING MILLS
10″ Garrison Five Stand Three High Bar Mill
10″x9″ Acme Four Stand Two High
10½″x12″ UE&F Single Stand Two High
14″x42″ Garrison Single Stand Two High
16″x20″ Waterbury Farrel Single Stand Two High
22″x28″ Univ. Three High Mill complete installation including motor
19″ Morgan Eight Stand Continuous Sheet Bar and Skelp Mill with Three Stands of Vertical Rolls
24″ Mackintosh Merchant Bar Mill. One Three High Pinion Stand, Two Three High Mill Stands, One Two High Bull Head Stand
30″ Morgan Three High Billet Mill
44″ Blooming Mill, Consisting of Pinion Stand-Roller Table and Catcher Table

SAW
No. 4 Ryerson High Speed Friction Saw. Hydraulic Feed Mechanism complete with 3 HP motor

SHEARS—ANGLE
4″x4″x½″ Long & Allstatter Double Angle Shear, Arranged for motor drive
6″x6″x⅝″ Hilles & Jones No. 2 Double Angle Shear, Arranged for Motor Drive
8″x8″x1″ Long & Allstatter Size C Double Angle Shear, Motor Driven

SHEARS—BAR
No. 3 Hilles & Jones Guillotine Type, Arr. for M.D. Capacity Shear, 3″ Round, 2½″ Square, 10″x1¼″ Flats, 6″x6″x½″ Angles
No. 10 Buffalo Armor Plate, Belt or Motor Drive, Capacity to Shear 3⅞″ Rounds, 3½″ Squares, 8″x1¼″ Flats, 8″x8″x⅝″ Angles

SHEARS—BLOOM
Mackintosh Hemphill Bloom Shear. Motor Dr. Capacity 10″x18″ Hot Blooms
National Roll & Fdry. Co. Hot Bloom Shear. Arr. for M.D. Capacity 8″x8″
350 ton Three Cylinder Up Cut Hydraulic Shear. Capacity 10″x10″ hot steel

SHEAR—GATE
12′ Beatty Mche. & Mfg. Co. Motor Driven. Capacity ⅝″ Plate

SHEAR—ROTARY
Newbold Rotary Shear, Arr. for M.D. Capacity Shear ½″ Plate, Joggle ⅜″. Also equipped with circle cutting attachment

SHEAR—ROTARY FLYING
United Engineering & Foundry Co., motor driven. 1″ rounds up to 2″x⅜″ flats

SHEARS—SQUARING
96″ Bliss No. 465, M.D. Capacity ¼″ Plate
12′ Bertsch, Arr. for M.D. Capacity 3/16″

STRAIGHTENER
⅜″ Hallden No. 2 Straightening & Cut-off Machine. Arr. for M.D. 12′ Cut-off

TESTING MACHINES
100,000 lb. Olsen Universal Four Screw Rotating Nut Type. Belt Driven
200,000 lb. Olsen Universal Four Screw Rotating Nut Type. Motor Driven

WIRE DRAWING MACHINE
Waterbury Farrel 7-Die Tandem Wire Drawing Machine. Capacity ¼″ down to No. 11 B&S Gauge

Pittsburgh Office 710 Park Bldg. • Manufacturing

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18″x12′ Hamilton Lathe Q.C.G., T.A., cone.
14″x6′ Mulliner Lathe, Q.C.G., T.A., cone.
Landis Plain Grinders, 12″x42″, 12″x52″.
No. 2 Morse Universal, 12″x30″.
No. 4 Landis Universal, 12″x66″.
28″ Gisholt Turret Lathe, 28″ Chuck, cone.
No. 6 W & S Turret Lathe, Wire, Feed, cone.
2½″ Acme Flat Turret Lathe, cone.
4½′ Morris Radial Drill, Gear Box, S.P.D.
3½′ American Radial Drill, Gear Box, S.P.D.
42″ Barnes Drill, Sliding Head, Tapping Attachment.
No. 11, 12, 13 Natco Drills.
28″ Cincinnati-Bickford Upright Drill, Gear Box, Tapping Attachment.

IROQUOIS MACHINERY CO.
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MACHINE TOOLS

4—#12HS Gould-Eberhardt Gear Hobbers, with motor.
6—#16HS Gould-Eberhardt Gear Hobbers, with motor.
1—24″x12′ Schumacher Boye Lathe, double back geared with chuck, steady rest, small face plate and 1 countershaft, 3 step cone.
8—No. 2 Colburn Manufacturing Drills with motor.
1—1″ National Shear.

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LARGE PLANER

48″x48″x16′ SELLERS PLANER. FOUR HEADS. ARRANGED FOR MOTOR DRIVE LESS MOTOR. AIR OPERATED CLUTCH. PRICE F.O.B. PHILADELPHIA.

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6′ AMERICAN Plane Radial Drill, Motor Drive, Motor on Arm
42″ COLBURN Vertical Boring & Turning Mill
THE E. L. ESSLEY MACHINERY CO.
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Heavy Duty Turret Lathe
HARDENED WAYS, MOTOR DRIVE
WIGGLESWORTH MACHINERY CO.
195 Bent St., Cambridge, Mass.

GEAR CUTTER

110″ NEWTON HIGH DUTY MOTOR DRIVE

Rosenkranz, Weisbecker & Co., Inc.
149 Broadway, N. Y. C.

ReMANUFACTURED MACHINE TOOLS
-(ORIGINATED BY US)-

Reg. U. S. Patent Office

Boring Machines, No. 2 Barrett, 5" bar
No. 2 Coffman, 3¾" bar
No. 3 Barnes Double End, 3⅛" bars

Boring Mills, 42" Gisholt
48" Gisholt
48" Colburn
52" Gisholt
54" Colburn
60" Colburn
60" Gisholt, Motor Drive
72" King, Motor Drive
72" Niles-Bement-Pond, Motor Drive
72" Bickford
10' Niles

Drills, 1, 2, 3 Spdl. Leland-Gifford
4 Spdl. Avey, 30" SW.
4 Spdl. Henry & Wright
4, 6 Spdl. Leland-Gifford
No. 2 Colburn, 3 & 4 spindle
No. 12 Colburn, 1 spdl.
No. D-4 Colburn, Heavy Duty
No. 3¼ Baker Heavy Pattern
No. 4 Foote-Burt Rail, 5 spdl.
No. 1, No. 3, No. 4 Baush Multiple
No. 41 Natco Multiple

Radials, 3' Western, Plain
3' Cincinati-Bickford Super Service
4' Carlton Plain, Motor Drive
4' Western, Plain, Motor on Column
4' Cincinnati-Bickford, Plain
5' American Triple Purpose
6' Western, Plain
6' American, Plain
7', 8' Western, Heavy Plain

Gear Cutters, No. ½ Pfauter Hobber, M.D.
No. 1, No. 2, No. 3 Pfauter Hobber
No. 5—48" Brown & Sharpe
No. 2—60" Goss Hobber
No. 6—72" Brown & Sharpe
Nos. 6, 61, 624 Fellows
18" Gleason Bevel Generator, M.D.
96" Newton Spur Gear
No. 36BM G. & E. Bevel Rougher

Grinders, Nos. 2, 2½ Universal (Bath Type)
No. 70 Heald Internal
No. 22—12" Heald Rotary Surface
No. 25—16" Heald Hyd. Rotary Surface
No. 16—26" Blanchard Vertical Surface
No. 16-A Blanchard Auto. Vertical Surface
16"x32" Landis Crank Shaft

Motor Driven Norton Grinders

6"x18"	10"x72"	16"x 50"
6"x32"	10"- 15" GAPx72"	18"x 96"
10"x18"	10"x 96"	18"-24" GAPx 96"
10"x24"	10"x120"	21"x 96"
10"-15" GAPx24"	14"x 36"	21"x144"
10"x36"	14"x 50"	23"x120"
10"x50"	14"x 72"	

Lathes, 16"x8' Lodge & Shipley
16"x9' Chard
18"x8' Lodge & Shipley
18"x12' American Geared Head
20"x10', 12' L. & S. Grd. Hd., M.D.
20"-40"x10' Rahn-Larmon Geared Head, Sliding Bed Gap
24"x12' Flather
24"x18' American Geared Head
24"x20' L. & S. Grd. Hd., Taper Att.
27"x18' Sidney, Taper Attachment
27"x18' Amer. Grd. Hd., Taper Att.
30"x12' Lodge & Shipley Grd. Hd.
36"x21' American Grd. Hd., Triple Grd.
36"x24' Bradford, Triple Geared, Taper Att.
40"x12' Fifield
46"x30' Houston, Standwood & Gamble, M.D.
60" New Haven Boring & Turning

Millers, No. 5-B, No. 6 Becker Vertical
Model "C2" Becker Vertical
24" Cincinnati, Duplex
24" Cincinnati Plain
No. 3 Garvin Duplex
No. 4 Hendey Mfg.
Type "B" Briggs Mfg.
No. 7-H Becker Mfg.
No. 8 Hendey Mfg.
No. 33 Becker-Brainard Mfg.
24"x24"x12' Ingersoll Adj. Rail
36"x36"x12' Newton Duplex
38"x44"x20' Ingersoll

Planers, 24"x24"x6' Rockford
24"x24"x12' Gray
30"x30"x6', 14' Gray
30"x30"x18' Cincinnati
36"x36"x8', 18' Cincinnati
36"x36"x14'—24' Cleveland Open Side
42"x42"x14' Gray
42"x42"x30' Niles-Bement-Pond
48"x48"x16' Niles-Bement-Pond
72"x60"x16' American

Presses, No. 01, No. 1 V. & O., O.B.I., M.D.
No. 1½" V. & O., O.B.I., Geared, M.D.
No. 20 Bliss, O.B.I., Motor Drive
No. CG-24 Ferracute, O.B.I., M.D.
No. 3, No. 5 V. & O., O.B.I., Geared M.D.

Turret Lathes—No. 6—2¼" Warner & Swasey
3"x36" Jones & Lamson
24" Gisholt, Taper Att.
24" Steinle, 6¼" H.S.
24" W. & S., Cross Trav. Turret
No. 4-L Gisholt Cross Sliding Turret, 9¼" H.S.
34" Gisholt, M.D.

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GOOD USED MACHINE TOOLS

PRESSES

No. 71 Swaine dbl. cr. 28" bet. uprights
No. 151 Ferracute dbl. cr. 45" bet. uprights, 3" str.
No. 6A Bliss dbl. cr. 48" bet. uprights
No. 664B Toledo embossing, 40" bet. uprights, 600 tons
No. 41 Toledo horning 1½" str.
Nos. 4A & 5A Bliss Stiles, horning
No. 9A Bliss Consolidated gap frame, solid knee
P2 & P3 Ferracute knee type
CA14 Ferracute, swinging knee
No. 41N V&O adj. knee, dial feed
No. 25½ Bliss consolidated horning
No. 16 Bliss horning & wiring
Nos. 51 & 101 Cleveland OBI
No. 6 Toledo OBI 2½" str.
Nos. 6, 7 & 21½ Bliss Consolidated OBI
Waterbury Farrel OBI 4" str.
No. 1½ Bliss toggle drawing 8⅛" & 5" str. 9250 lbs.
No. 164 (No. 173) Toledo toggle drawing 13" & 7" str. 20,000 lbs.
No. DDG 54 Ferracute double action cam drawing, 5" & 2" str. 5400 lbs.
25 ton Oilgear hydraulic press 2½" str.
No. 2 Standard Machinery Co., screw press 12" str. 5200 lbs.
No. 30¾ Bliss arch press, 4" str. 7200 lbs.
750 ton Baldwin Southwark triple action hyd. toggle drawing press, 37", 26" & 12" str.

GEAR MACHINERY

No. 77A Fellows gear shaper
Nos. 1 & 5A Lees Bradner hobber
No. 5A 14" x 8" Lees Bradner generator
Nos. 12HS & 18H Gould & Eberhardt hobbers
No. 5T Fellows hourglass thread generator straight side
No. 7 Rockford 3¾" str. 9000 lbs.
No. 8-7 Z & H 2¾" str. 6000 lbs.
No. 65 Bliss Consolidated 3" str. 9000 lbs.
No. 66 Consolidated 5" str. 12,500 lbs.
No. 74½ Bliss 6" str.
No. 55 Toledo 10" str. 14,000 lbs.
No. 55½ Toledo 2", 4" & 5" str.
No. 56 Toledo 5" & 6" str. 10,650 lbs.

MISCELLANEOUS

Waterbury Farrel OB non-incl. gap frame, 1½" str. 3700 lbs.
Fremont OB non-incl. gap frame, 2¼" str.
Nos. 75 & 76 Toledo OB non-incl., 2½" & 3" str., 4500 & 7750 lbs.
Nos. 4M & 4P Fellows gear shaper cutter checker
National gear checker
No. 12 Barber Colman
36" x 6" G. & E. spur
48" No. 4 Brown & Sharpe
Nos. 2 and 2½ Bilton
Lipe 2 spindle chamferer
Gleason bevel gear tester
No. 10B Lees Bradner gear grinder
National worm grinder
Pratt & Whitney worm grinder

ASK FOR STOCK LIST OF SOME 2000 TOOLS IN OUR WAREHOUSE

MILES MACHINERY CO.
Saginaw, Mich.

EMCO REBUILT MACHINE TOOLS

BORING MILLS

2—72" Cincinnati Rapid Production, m.d., p.r.t., 2 swivel heads
30" Gisholt, cone
42" Gisholt, m.d., 2 heads
42" King, m.d., 2 heads on rail, 1 side head, p.r.t.
51" Bullard, m.d., 2 heads
10' Niles, cone, 2 heads, old type
No. 4 Niles-Bement-Pond Horizontal, 5½" bar, m.d.
Niles-Bement-Pond Cylinder Borer, 12" main bar

MILLING MACHINES

No. 2A Becker, cone
Nos. 4B, 5, 6 Becker Vertical, cone
No. 25 Ohio Universal, cone
No. 3 Cincinnati Universal, cone
Nos. 1, 2, 3, 4 Cincinnati Plain, cone
No. 3 Cincinnati Plain Dial Type, Timken Bearings
No. 2H Brown & Sharpe Plain, cone
No. 3 Kempsmith Plain, cone
No. 2 Van Norman Duplex, belt
No. 3 Hendey-Norton Plain, cone
No. 13B Brown & Sharpe Plain, s.p.d.
36" Cincinnati Plain Automatic, spur drive
24" Cincinnati Automatic Duplex, belt
48" Oesterlein Tilted Offset, m.d., Timken Bearings
C66A Newton 3 spindle Continuous, s.p.d.
Gooley & Edlund Briggs Type, cone

ROLLS

24' Niles, pyramid type, strong back, shipyard type. Capacity 1" plate. Weight 154,000 lbs.
20' Covington, pinch type. Cap. 1½" plate, belt drive. Weight 150,000 lbs.

PRESSES

300 ton Niles Hydraulic Wheel Press, m.d.
No. 496D Toledo D.C. Toggle Drawing, m.d., 8' between housings. Stroke of blankholder 11½". Weight 160,000 lbs.
No. 268¼B Toledo D.C. Toggle Drawing, m.d. Stroke of blankholder 15". Weight 175,000 lbs.
No. 94 Bliss Consolidated
No. 93A Toledo S.S. D.C., m.d.
No. 92B Toledo D.C. geared
No. 54A Toledo Special, m.d.
DG 53 Ferracute Redrawing, m.d.
S51 Ferracute D.C.
No. 50-4-36 Minster S.S. D.C.
No. 33 Swaine O.B.I.
No. 25A Bliss
No. 16 Bliss Horning
No. 6 Waterbury-Farrel D.C.
No. 5 Bliss Stiles Type
C4 Ferracute O.B.I.

ENGINE LATHES

14"x 6' Bradford, cone
14"x 6' Lodge & Shipley, cone
14"x 7' Lodge & Shipley, cone
14"x 8' American, cone
16"x 6' American, cone
16"x 6' Hendey, yoke head
16"x 7' Pratt & Whitney, cone
16"x 8' Lodge & Shipley Selective Head
16"x 8' Monarch, cone
16"x 8' Reed Geared Head
16"x10' American, cone
16"x14' American, cone
18"x 8' Lodge & Shipley Selective Head
18"x 8' Monarch Geared Head
18"x 8' Mueller, cone
18"x10' Schumacher-Boye, cone
20"x 8' American, cone
20"x14' American, cone
20"x12' American, cone
20"x12' Lodge & Shipley Selec. Hd.
20"x13' Boye & Emmes Coneless, 12 speed head
21"x 8' LeBlond, cone
21"x10' LeBlond, cone
24"x10' Bridgeford, cone
24"x15' Reed Geared Head
24—48"x16' McCabe Two in One
24"x16' Schumacher-Boye, cone
24"x18' Lodge & Shipley Patent Head
26"x12' Boye & Emmes, cone
27"x16' Bridgeford, cone
36"x18' Niles, cone
36"x29' Johnson, cone
42"x24' Springfield, cone
42" raised to 53"x39' Putnam, cone

RADIAL DRILLS

3' Carlton Sensitive
4' American Triple Purpose, d.c. drive
4' American Triple Purpose, gear box on base
4' Carlton, gear box, inc. head
4' Cincinnati Bickford Universal, gear box
4' Dreses Plain, gear box
4' Hammond Jack Knife, m.d.
4' Morris Plain, gear box
5' American Triple Purpose, gear box
5' American Triple Geared, gear box
5' Dreses, gear box
5', 6' Niles, d.c. drive
6' American Triple Purpose, m.d. on arm
7' Fosdick, cone

Partial Listing only.
Send us your inquiries.

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TO MAKE ROOM FOR OTHER TOOLS

1 SET ROLLS

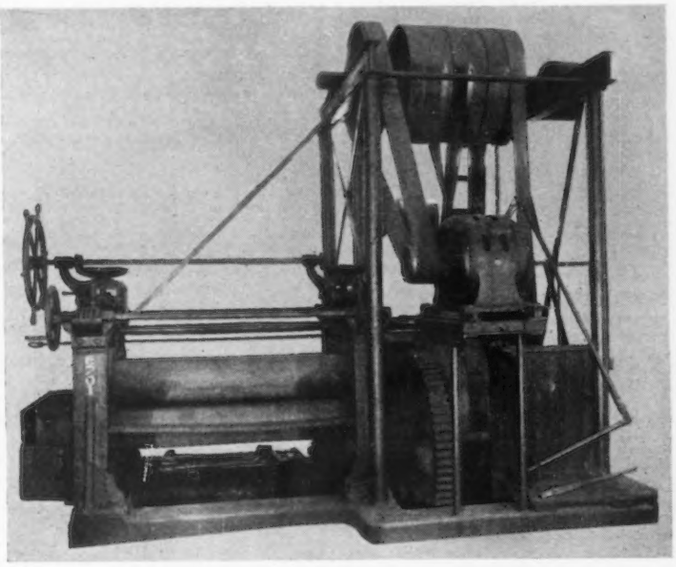
Plate Straightening

60" Complete with Motor Drive

7 Rolls 10½" Diameter

Capacity 1½" Plate

IMMEDIATE DELIVERY



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HIGH GRADE MACHINE TOOLS

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14"x 6' LeBlond Geared Head, M.D.
20"x 8' Lodge & Shipley Geared Head, M.D.
24"x40"x14' McCabe Geared Head Sliding Head.
32"x16' Rahn Larmon Geared Head, M.D.
30"x20' American 12 speed Geared Head.
36"x22' Putnam Geared Head Lathe.
36"x22' Lodge & Shipley Geared Head Lathe.
42"x18' Bridgeford Geared Head Lathe.
46"x30' Houston, Stanwood & Gamble Geared Head Lathe.

GRINDERS

6"x18" Landis Plain Self Contained Grinder.
10"x24" Landis Plain Self Contained Grinder.
Nos. 50, 55, 60, 65 Heald Internal Grinder.

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1" Acme Cone Drive.
2" Acme Cone Drive.
2" Landis Bolt Cutter.
2½" Landis Bolt Cutter, Lead screw.
2" Landis Pipe Machine.

BORING MILLS

60" Gisholt Vertical, P.R.T., S.P.D.
7" Niles Horiz. Floor Type M.D.

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No. 4 Kempsmith Maximiller, M.D. vert. Hd.
No. 4 Rockford Rect. O.A. new.
No. 3 Cincinnati Plain, Cone.
No. 3H LeBlond Cone, Plain
No. 2 Cincinnati, Cone.
No. 3 Kempsmith Universal Cone.
No. 5B Becker Vertical Miller.

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36" Cincinnati Openside Crank Planer, M.D.
60"x48"x20' Liberty Openside, M.D.
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72"x60"x14' Liberty Openside, M.D. Aux. Housings.

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3½', 4, 5, 6' American Triple Geared.
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3, 4' American Triple Purpose, Enclosed Head.

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20" American, S.P.D. Mold makers table and vise.
16, 20 and 24" Gould & Eberhardt cone drive.
16, 20 and 24" Gould & Eberhardt S.P.D.

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PLANERS
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Univ., Plain, Internal, Rotary
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and all other types of machine tools

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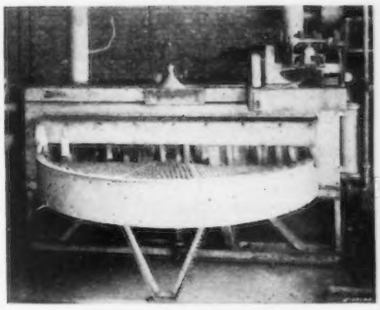

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Continuous Rotary Sandblast

TYPE SG (Suction Gravity) with Motor & Starter

Still intact in original setting at the former General Household Utilities Co.

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Grinder Centerless, Heim, M.D.
Grinder Knife 10' Bridgeport, M.D.
Grinder Roll 28"x76" Farrel, M.D.
Press Forging 150 ton United Steam Hyd.
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Slitters Gang 18" W-F & 36" Yoder.
Straightener 48" Aetna-Std. 17-3¾", M.D.

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PLATE BENDING ROLLS NEW CAPACITY ½" MILD STEEL PLATE ROLLS 11" DIA., 8' LONG.

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INGERSOLL Planer Type Miller 3 Heads.
BROWN & SHARPE No. 1-D Universal Millers.
NIAGARA No. 26 Arch Presses, like new.
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NIAGARA ¼" Cap. x 10' Power Gap Shears.
BLISS & TOLEDO Presses—all sizes.
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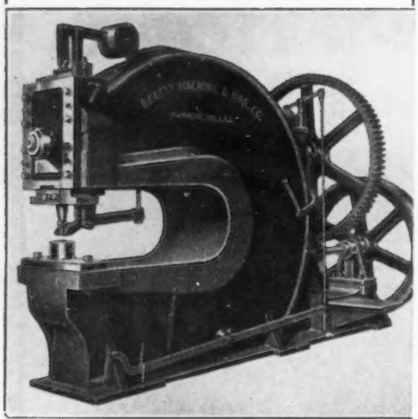

PUNCHES (Single End)

2—No. 6 BEATTY 1" thru 1".
1—CLEVELAND ¾" thru ¾".
1—CLEVELAND 1¼" thru 1".
1—CLEVELAND COPER 1" thru 1".
1—CLEVELAND COPER 2½" thru 1½".
1—No. 7 KLING 1¼" thru 1".
1—No. 5 LONG & ALLSTATTER ⅝" thru ⅝".
1—No. 2 LONG & ALLSTATTER 1" thru 1".
1—ROCK RIVER ¾" thru ¾".
1—ROCK RIVER ½" thru ½".
1—No. 15 WILLIAMS & WHITE ⅞" thru ¾".
1—No. 6 WHITING 1" thru 1".
1—LONG & ALLSTATTER 3½" thru 2".
2—AMPLEX STEEL COMB. ¾" thru 7/16".
6—WHITNEY HAND.

PUNCHES (Double End)

1—CLEVELAND 1" thru 1".
1—No. 2 HILLES & JONES, 1" thru 1".
1—No. 5 LONG & ALLSTATTER ⅝" thru ⅝".
1—No. 8 WHITING 1" thru 1".
1—No. 2 LONG & ALLSTATTER 1" thru 1".

PUNCHES (Multiple)

1—No. 4 CLEVELAND MULT. 60".

PUNCHES (Horizontal)

1—No. 2 HILLES & JONES 1" thru 1".
1—No. 2 LONG & ALLSTATTER 1" thru 1".
1—No. 4 LONG & ALLSTATTER ¾" thru ¾".
1—SOUTHWARK 1" thru mild steel.
1—CAMDEN HORIZ. & VERT. 1" thru 1".

RIVETERS (Pneumatic)

2—70-TON HANNA.
4—50-TON HANNA.
2—30-TON HANNA.
10—20-TON HANNA.
17—15-TON HANNA.
2—10-TON HANNA.
3— 3-TON HANNA.
2—75-TON ALLEN.
1—30-TON ALLEN.

RIVETERS (Stake)

1—No. 1 L & A ¾".
1—NEW DOTY ⅜".
1—ROCK RIVER ⅜".
1—No. 6 WHITING ⅜".
1—No. 4 LONG & ALLSTATTER ⅜".

RIVET (Heaters)

3—STYLE C BERWICK.

RIVETING (Hammers)

2—No. 1½B HIGH SPEED 1/16" to ⅛".
1—No. 2A HIGH SPEED ⅛" to 5/32".
9—No. 3A HIGH SPEED 3/16" to ¼".
2—No. 3A H.D. HIGH SPEED ¼" to 5/16".
7—No. 4A HIGH SPEED ¼" to 7/16".
3—No. 5A HIGH SPEED ⅜" to ⅝".
1—No. 5½B HIGH SPEED ½" to ⅝".
1—No. 7B HIGH SPEED ¾" to 1½".
1—No. 16 PENN ¼".
1—No. 4 WMS. & WHITE 9/16".

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1—5/16" GRANT.
1—No. 2 GRANT ¼".
1—No. 107 GRANT 5/16".
1—No. 30E LINLEY ⅜".

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YOUR INQUIRY WILL BE GIVEN
PROMPT ATTENTION

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20", 24", 28" GOULD & EBERHARDT SHAPERS Cone driven
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SPRAGUE DYNAMOMETER—75 to 150 HP
Hundreds of other machine tools in stock.

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No. 59¼ TOLEDO S.S. Tie Rod Press.
National 3" and 5" Late Type High Duty Guided Overarm Heading Slide Upsetting and Forging Machine.
BAR and GUILLOTINE SHEARS: 1½" to 4".
30—UPSETTING & FORGING MACHINES: 1" to 5".
10—BULLDOZERS: All Sizes.
D. & K. Leaf Brake—10'x3/16".
750 Ton CLEVELAND 10' Multiple Punch.
350 Ton L. & A. 10' Multiple Punch.
#6 Wells Multiple Punch, 65" between housings.
50 Ton Eastern Hydraulic Straightening Press.
FORGING EQUIPMENT: Hot Saws, Forging Rolls, Trimming Presses, Board Drop Hammers, Steam-Nazel and Bradley Hammers, Die Sinkers and Miscellaneous equipment.
THREADING MACHINES: All Sizes.
STRUCTURAL MACHINERY: Punches, Shears, Multiple Punches, Riveters, Etc.
THE LARGEST STOCK of BOLT, NUT and RIVET MACHINERY in the WORLD for both Cold and Hot Made Bolts, Nuts and Rivets.

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84" Pond, Vertical Boring & Turning Mill, 2-swivel heads, 72" table, 54" under rail, power elevation to rail, friction feed, cone drive. Good condition.

FORGING MACHINE

1½" Acme, Steel Frame, side shear, for M.D. excellent condition.

PRESS

No. 59¼ Toledo S.C., Tie-Rod, D.B.G., bed 40"x40", ram 32"x24", die space 18", stroke 8". Wt. 80,800 lbs. Friction clutch, belt drive. Good condition.

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WELDERS
AT *BARGAIN* PRICES

ARC WELDERS

400 ampere Gen. Elec. 60/60 volt 24 KW generator driven by 75 HP 220/440 volt 3 phase 60 cycle motor.

SPOT WELDERS

10 KW 440 volt National
12½ KW, 45 amp. 440 volt Agnew

As Welder Specialists we offer these units completely overhauled, performance tested and guaranteed. Write, wire, phone for prices or visit our plant for inspection.

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EQUAL TO NEW PLANERS

2—48" x 48" x 18' D & H Closed Housing Type, 4 heads, Box tables, DC reversing M/D with 35 HP motors.
3—48" x 48" x 14' Detrick & Harvey ditto above.
1—42" x 42" x 12' Hamilton, 4 heads, ditto above.

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1 Complete Sheet Galvanizing Equipment Rig, New Pot, Pickle Crate and Accessories, Flux Boxes, Rolls and Gears.
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including 16" break down rolls

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Chambersburg double frame steam hammer, designed for necking shells.

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Combination machine, punch 1" through ½", shear 4 x 4 x ⅜ angles, 6" x ⅝ flats and ½" plates. Perfect condition. May be seen in operation. Make an offer.

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12'-¼" DREIS & KRUMP POWER APRON BRAKE, New 1937—M.D.

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Sizes 13 — 16

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WATER TUBE BOILERS

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Greeves Etchell ¾-ton 3 graphite electrode type Arc Melting Furnace, 500 KVA Oil Transf., 4000V—120-25 cycle, or 60 cycle current complete with electrical equipment.

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300 KW General Electric
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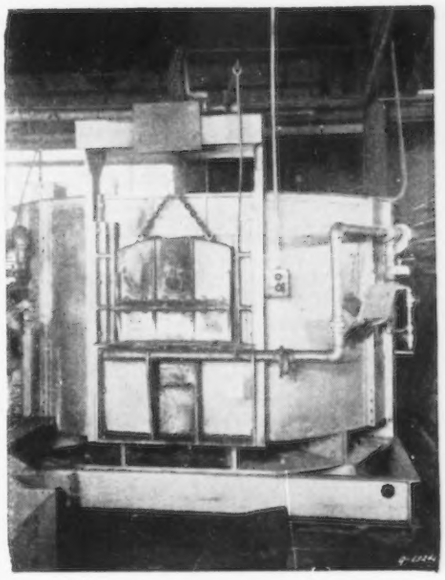

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20" 22" 36" 45" 52" in stock.
Rectangular and separator magnets.
Magnets repaired and rewound.
Magnet specialists since 1910.

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20 Ton Ohio Steam Loco. Crane.
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25 Ton Lima 60' Boom, Diesel Caterpillar.

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OVERHEAD CRANES & HOISTS

1—30-ton Shaw, 4-motor, 56'0" span, 220 vo. D.C.
1—20 ton Morgan, 4-motor, 45'10" span, 220 vo. D.C.
1—10-ton Morgan, 3-motor, 42'0" span, 220 vo. D.C.
1—10-ton Cleveland, 4-motor, 44'0" span, 220 vo. 3 ph. 60 cy.
2—5-ton Toledo, 45'0" span, 3-motor, 220 vo. 3 ph. 60 cy.

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CRAWLER CRANES
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"STONE" *The Crane Man*
16912 Fairfield Ave., Detroit, Mich.

RE-NU-BILT MOTORS GENERATORS TRANSFORMERS LARGE & HEAVY ELECTRIC POWER EQUIPMENT

Thoroughly Tested Before Shipment and Guaranteed

MORE THAN 50% SAVING

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1—1700kw Whse 170/340V. 3U to 2500HP 2300V. Syn
1—1250/1500kw Whse 125/250V. 3U-1930kva 2300V. Syn
1—1200kw Cr. Wh. 250V. Gen to 1750kva 2200V. Syn
1—1000kw G.E. 250V. Gen. to 1400HP 2300V. Syn
1—1000kw G.E. 600V. Gen to 1400HP 6600/2200V. Syn
1—750kw Whse 600V. Gen to 1100HP 2300V. Syn
1—750kw G.E. 275V. Gen to 1100HP 2300V. Syn
1—500kw G.E. 600V. Gen to 700HP 13200V. Syn
1—500kw G.E. 250V. Gen to 700HP 2300V. Syn
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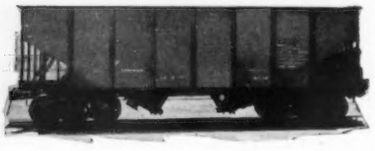

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Rockford Illinois

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Care *The Iron Age*, 239 W. 39th St., New York

WANTED—SEVERAL YOUNG MEN preferably with office training in steel or allied lines—(for steel sales organization, having warehouses throughout country)—who are willing to undergo serious training to learn sales end of business. Openings now in several of our branches. Do not apply unless you have unquestionable ability and want to get ahead by hard work based on that ability. Must be serious, level-headed, and possess good judgment, others should not apply. Advise age, experience, nationalty, marital state, and full details. Address Box T-815, care *The Iron Age*, 239 W. 39th St., New York.

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WANTED: COLLEGE GRADUATE in metallurgy, to sell low silica fluxing stone in Chicago area. Nominal salary and expenses to start. Address Box 7688A, care *The Iron Age*, 1012 Otis Bldg., Chicago, Ill.

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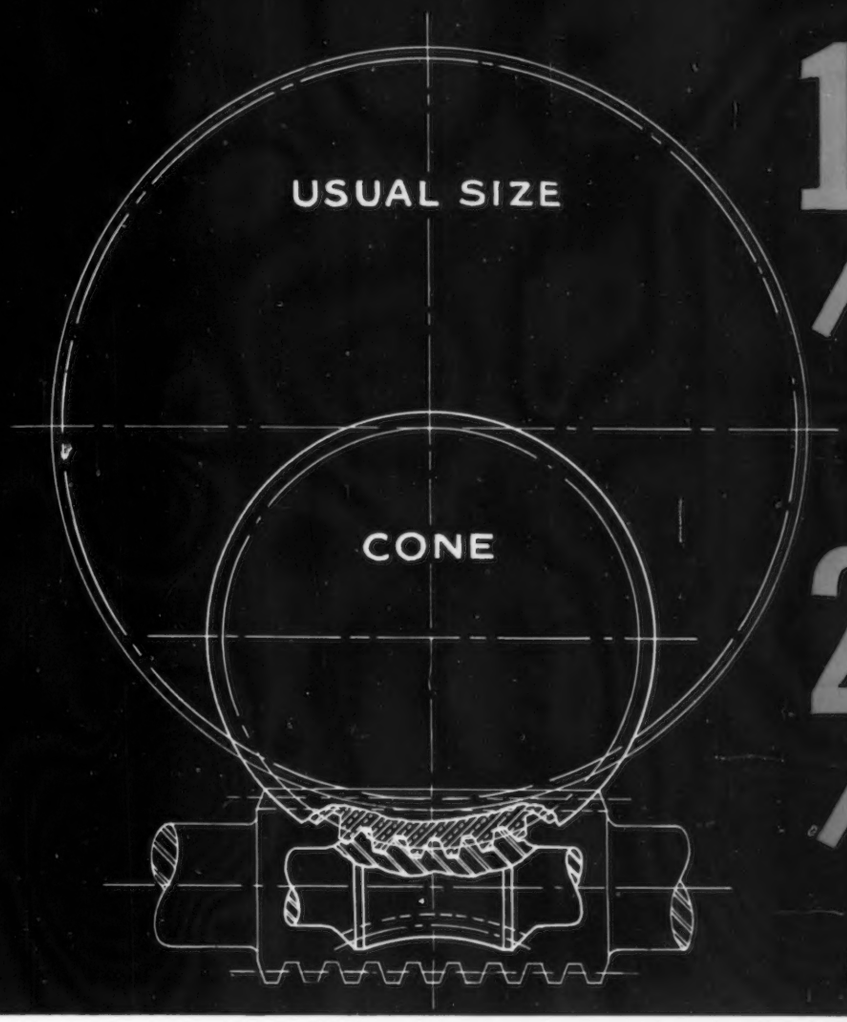


1/3 the weight

2/3 the size

EVERY POUND of Cone-Drive gearing in an airplane represents a *Net Saving* of over two pounds in total weight.

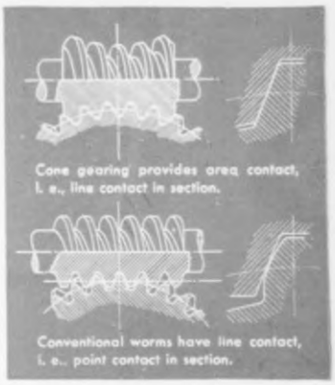
Compared with conventional gearing, Cone-Drive's exclusive double enveloping construction provides continuous area contact on from 3 to 7 teeth (depending on the particular gearset). In addition, the straight-sided tooth form of Cone-Drive gearing insures uniform tooth loading from tip to root with maximum tooth thickness and strength at the root.

The combination of these two exclusive advantages means that ⅓ smaller Cone-Drives do the work of conventional gearing weighing more than 3 times as much—aside from possible weight savings from smaller housings or brackets, design improvements, etc.

In hundreds of airplane installations over a period of 5 years—for retractable landing gears, aileron and flap controls, variable pitch propellors, machine gun elevating drives, synchronizer drives, etc.—there has been not one reported failure of Cone-Drive worm gearing.

OTHER CONE-DRIVE ADVANTAGES—

1. Highest efficiency in the worm gear field.
2. Worm and wheel wear 'in'—not 'out'.
3. Exclusive meshing action squeezes lubricant 'in' instead of 'out'.
4. Positive self-locking action available when desired.
5. Less wear, longer life, due to lower unit pressures.


Cone gearing provides area contact, i. e., line contact in section.
Conventional worms have line contact, i. e., point contact in section.

CURRENT CONE OPERATING RANGES
Ratios . . . Low, 1 to 6; High, 200 to 1.
Speed, Low, 1/15rpm.; High, 30000rpm.
Sizes (C.D.) Low, 5/8 in.; High, 27½ in.

If you do not know the complete technical story of Cone-Drive gearing, may we suggest you write or wire immediately for a copy of Technical manual No. 223a.

CONE WORM GEAR DIVISION **MICHIGAN TOOL COMPANY**
7171 E. McNICHOLS ROAD, DETROIT

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—in Steel, it's TIMKEN Alloy Steel

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